30 NOVEMBER 1961

ONE SHILLING
AND SIXPENCE

ELECTRICAL TIMES

INDUSTRY

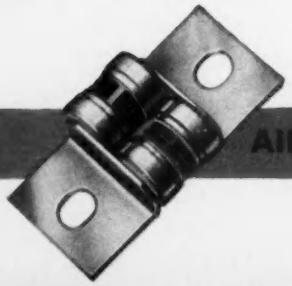
ELECTRICITY SUPPLY

DOMESTIC CONSUMERS' UNITS

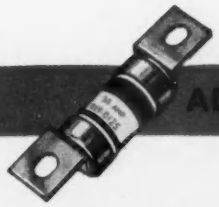
PLUGS

TRACTION

RAILWAY SIGNALLING

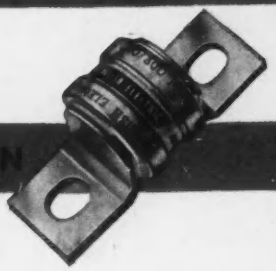


AIRCRAFT



ADMIRALTY & INTERSERVICE

SEMI-CONDUCTOR RECTIFIER PROTECTION



'ENGLISH ELECTRIC'

H.R.C. CARTRIDGE FUSE-LINKS

THE STANDARD OF
QUALITY AND PERFORMANCE
THE WORLD OVER

FUSEGEAR DIVISION, EAST LANCASHIRE ROAD, LIVERPOOL 10

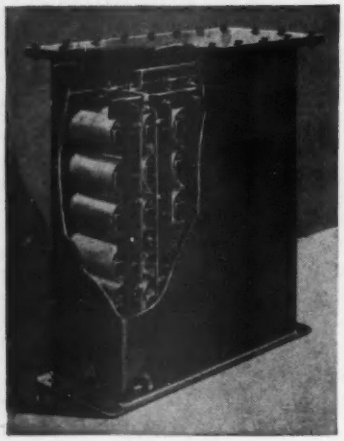
FG.64

The English Electric Company Limited, English Electric House, Strand, London, W.C.2

Four Contacts per Turn.

The foil in these Bryce capacitors is extended beyond the edge of the impregnated paper dielectric to right and left alternately, and the unique spring-loaded end-contacts provide four conducting paths on each turn of foil, giving better electrical and thermal conduction, and an almost completely non-inductive winding.

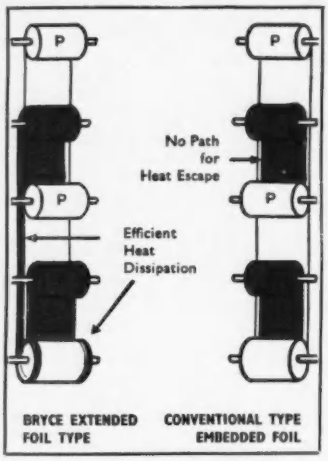
The importance of minimal heat production and improved dissipation requires no emphasis, since it is within the experience of all Electrical Engineers that heat is probably the commonest cause of capacitor breakdown. The Bryce Extended Foil capacitor element holds down temperature rise because there is improved heat transfer from dielectric to case side-walls and less heat generated due to resistance losses.



No Processed Joints.

The spring-loaded pressure contacts at each end of the capacitor element supersede the conventional method of inserting a connection strip in the capacitor element during winding.

With this arrangement the strip only makes contact over a small area of foil, and the length of the current path is great, with consequent resistive and inductive losses. Also this method is known to tend to give rise to internal discharges. The method of using a soldered connection from the foils, while overcoming these disadvantages, introduces the risk of damaging the paper dielectric by overheating.



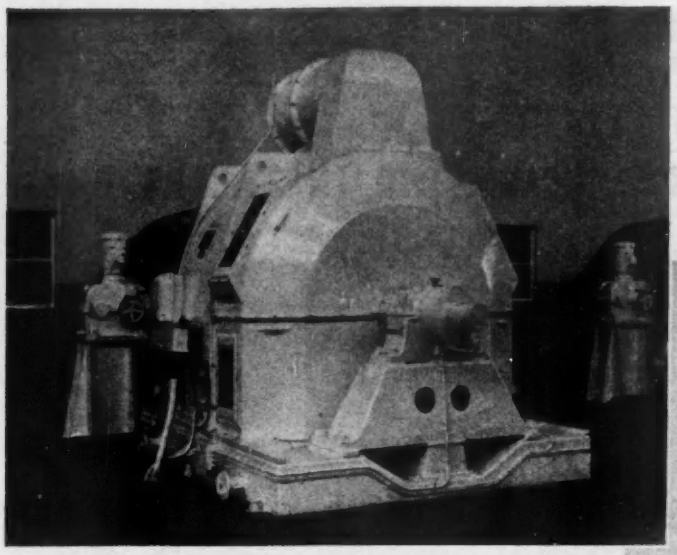
Short Current Path.

The current path is the most direct conceivable and the multiplicity of contact points provides insurance against faulty connection, even under the most severe surge conditions. Improved efficiency of the conducting path minimizes current densities and consequently keeps to a minimum the temperature rise due to this cause.

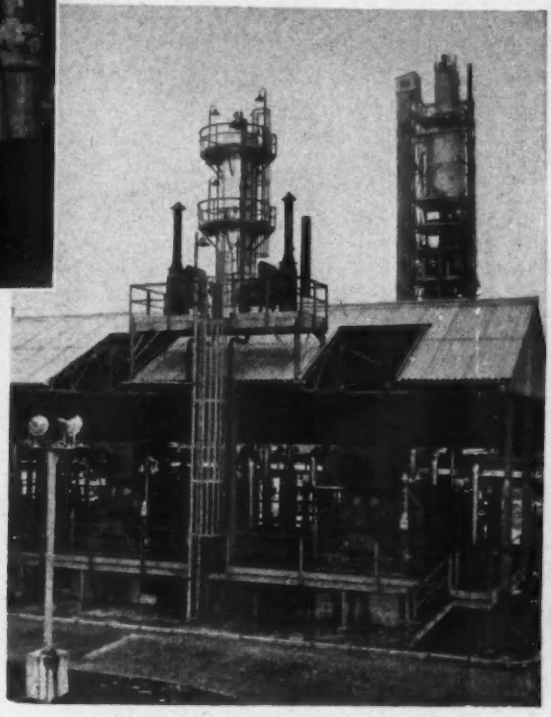
Better Heat Dissipation.

With projecting foils there is a high conduction path for heat from the centre of the element to the oil or Aroclor which is used as a coolant. The heat conductivity is much better than that with embedded foils where heat has to be conducted through paper which is a very poor heat conductor. The lower temperature gradient in Bryce Capacitors improves their expectation of life.

BRYCE BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey Telephone: Franklin 1101-7
Broadway/bec 7



An example of numerous N-S variable-speed a.c. motors driving chemical works compressors—an 800/368 h.p., 250/115 r.p.m. pipe-ventilated machine, for direct connection to the 11,000 volt supply.



Two 350/120 h.p., 585/200 r.p.m. N-S variable-speed a.c. motors driving compressors at Coryton Refinery (Mobil Oil Company Ltd.). The motors, which are pressurized through an activated-carbon filter, have Asmag control operating in conjunction with a pneumatic pressure transducer.

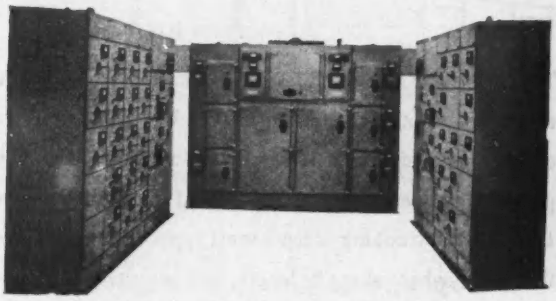
L.S.E. serve the CHEMICAL INDUSTRIES

£500,000 contract for L.S.E. motors and control gear for polythene production

Thousands of L.S.E. motors (in many instances allied with L.S.E. control gear) already serve modern chemical and allied plants. In particular, N-S variable-speed a.c. motors are much favoured because of the ease with which their speed can be steplessly controlled in accordance with the demands of the process, their efficiency and their reliability for continuous operation for long periods without shut-down.

Now L.S.E. have been awarded a contract valued at over £500,000 for N-S variable-speed a.c. motors, flameproof motors and control gear, for polythene production* in Eastern Europe—a contract which typifies the complete integrated power equipment which L.S.E. can offer practically every industry, everywhere.

* Production machinery by Simon Carves Ltd., "know how" by I.C.I.

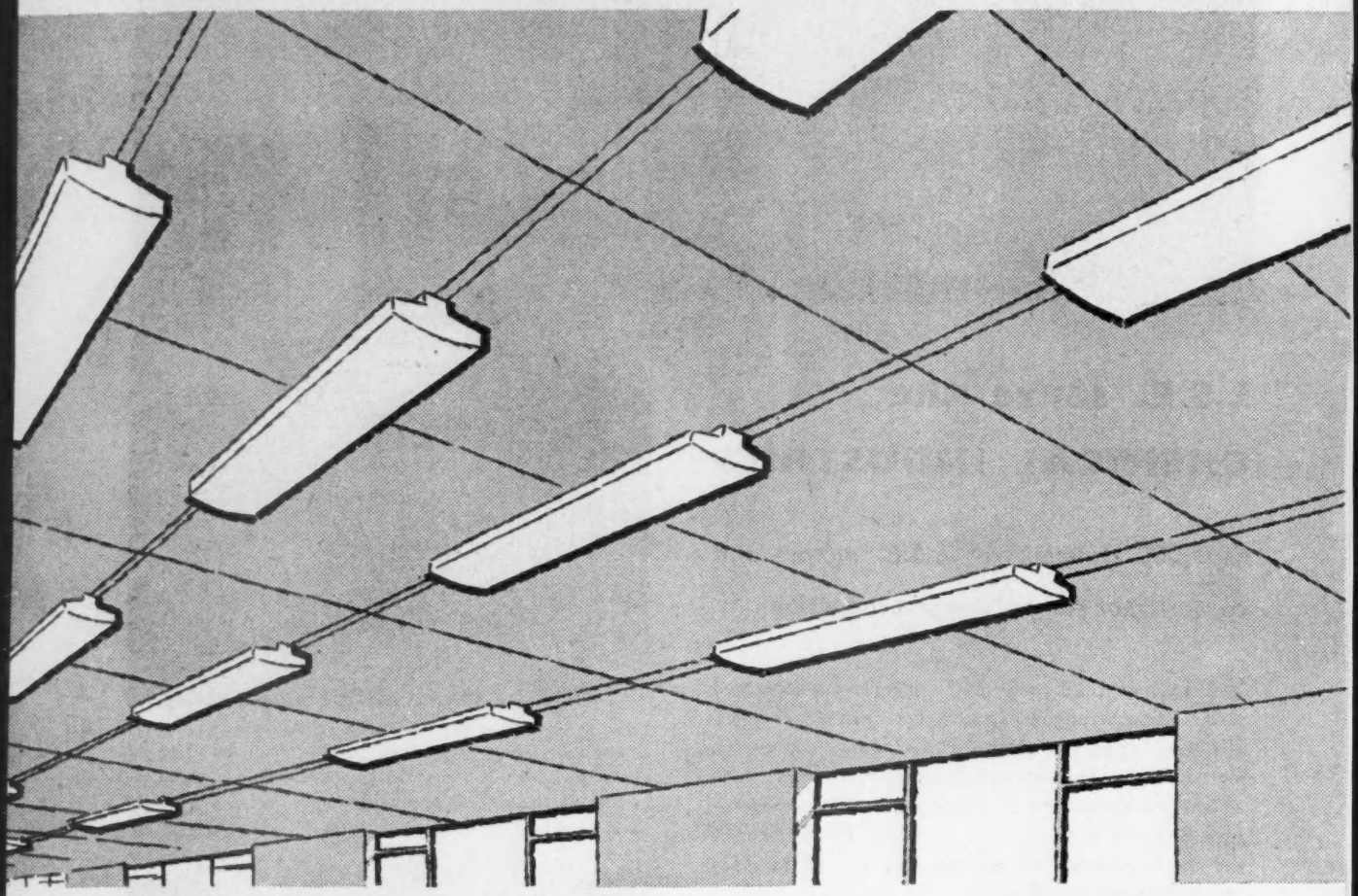


Centralised draw-out control panels, and specially designed mains panels, for a chemical works.

LAURENCE, SCOTT & ELECTROMOTORS LTD.

Specialist Makers of Electric Motors and Control Gear since 1883 NORWICH NOR 85A

UNISTRUT
TRUNKING
FOR *CHEAPER* AND *NEATER* LIGHTING INSTALLATIONS

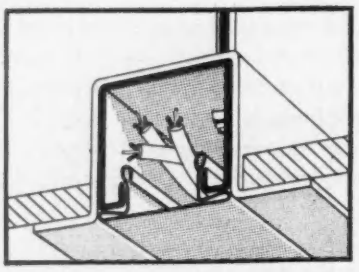


THE UNISTRUT SYSTEM provides the cheapest and simplest method of installing lighting units. UNISTRUT is rapidly and easily assembled, thus reducing on-site costs and time, and it ensures perfect alignment, even when butted to form continuous runs. UNISTRUT trunking accepts most types of fluorescent or tungsten fittings anywhere along its length, and permits the re-arrangement of the lighting at any time.

Send now for comprehensive literature on **UNISTRUT**, the answer to your framing and support problems. Write to:—

UNISTRUT DIVISION OF SANKEY-SHELDON LIMITED

43-45 Broadwater Road, Welwyn Garden City, Herts.
Tel: Welwyn Garden City 26321 (4 lines)

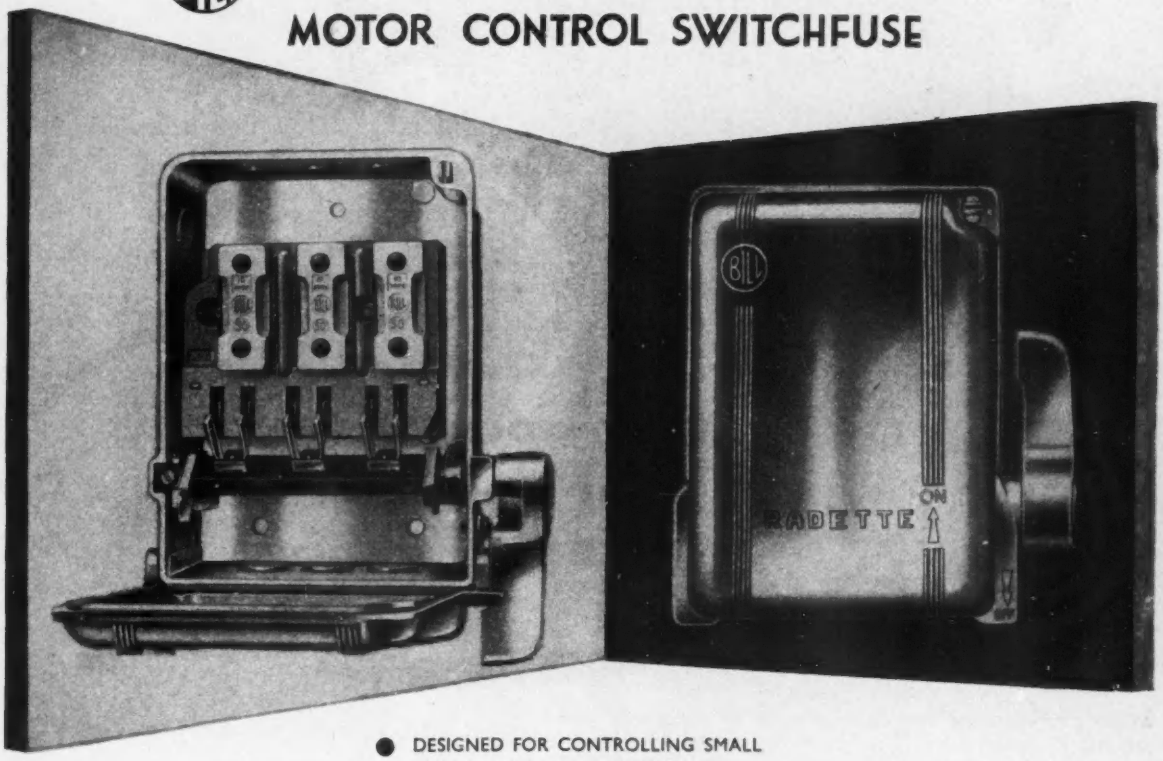


UNISTRUT dual-purpose trunking

Where trunking and false ceilings are to be supported, the UNISTRUT 'Top Hat' section is simply placed over the top of the required length of basic UNISTRUT channel. This permits ceiling panels to be closely fitted to each side of the channel, which is itself left open until the wiring installation is completed. Closure is made by standard UNISTRUT closer strip which gives a neat, flush finish.

You cannot buy better gear

BILL RADETTE Q1438 MARK II
MOTOR CONTROL SWITCHFUSE



- DESIGNED FOR CONTROLLING SMALL MOTORS NOT EXCEEDING 5 H.P.
- 10 AMPERE 500 VOLTS, 3 PHASE, QUICK MAKE AND BREAK SWITCH WITH SUBSTANTIAL CONTACTS FOR HIGH CONTACT EFFICIENCY AND LONG LIFE
- BILL ARC DAMPING TYPE FUSES FITTED COMPLETE WITH FUSE WIRE BY QUICK ACTION CLAMPS
- AMPLE KNOCKOUTS AND GENEROUS WIRING SPACE PROVIDED. 3—¾" KNOCKOUT HOLES TOP AND BOTTOM. 1—¾" KNOCKOUT HOLE IN LEFT HAND SIDE FOR STARTER CONNECTION.
- 'THROUGH' WIRING ARRANGED UNDER THE SWITCH BASE
- NO DISMANTLING OF SWITCH MECHANISM IS NECESSARY
- SOLID FORTOL BRUSH BAR TO ELIMINATE EARTHING
- FINISHED IN BILL SILVERLOSE— A DURABLE STOVED ALUMINIUM ENAMEL

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM·20

LONDON, S.W.1 A. W. ZELLEY, N. PAYNE, R. W. HANKINSON, GILLINGHAM ST.
MIDLANDS G. H. GARBETT, H. WILLIAMS, HEAD OFFICE.
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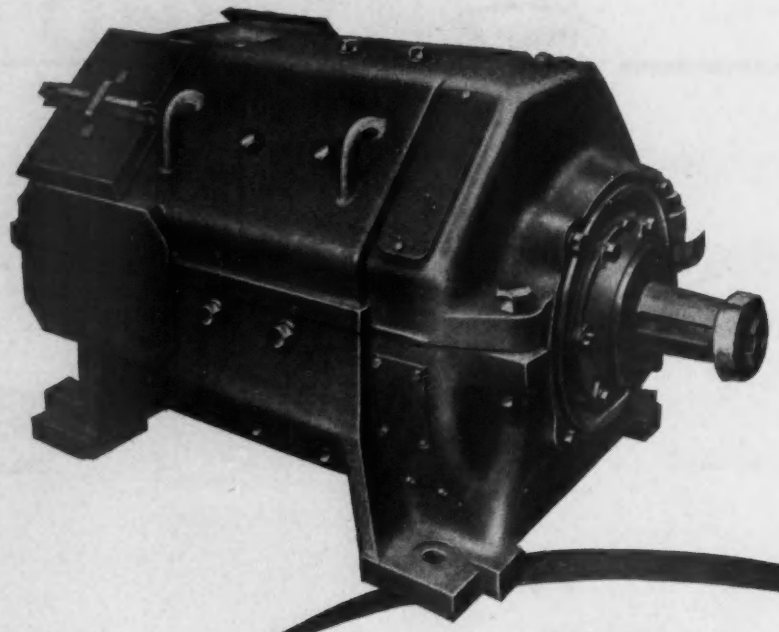
GLASGOW J. D. HARRIS, W. SPY, SANDYFORD PLACE
BELFAST R. A. SIMPSON, DONEGALL ST



Over 4,000 good reasons for choosing MDX mill motors

SOME OF THE MANY FAMOUS USERS OF MDX MOTORS:

HOME

Bairds & Scottish Steel Ltd.
Briton Ferry Steel Co. Ltd.
Brown Bayley Steels Ltd.
Colvilles Ltd.
Darlington Forge Ltd.
Dorman Long (Steel) Ltd.
English Steel Corporation Ltd.
Firth-Vickers Stainless Steels Ltd.
Ford Motor Company Ltd.
Guest Keen Iron & Steel Co. Ltd.
Lancashire Steel Manufacturing Co.
Llanelly Steel Co. Ltd.
The Park Gate Iron & Steel Co. Ltd.
The Patent Shaft Steel Works Ltd.
Richard Thomas & Baldwins Ltd.
Round Oak Steel Works Ltd.
Samuel Fox & Co. Ltd.
Shepcote Lane Rolling Mills Ltd.
The Staveley Iron & Chemical Co. Ltd.
The Steel Company of Wales Ltd.
Steel Peech & Tozer
Stewarts & Lloyds Ltd.
South Durham Steel & Iron Co. Ltd.
Taylor Bros. & Co. Ltd.
The Templeborough Rolling Mills Ltd.
Thomas Firth & John Brown Ltd.
Whitehead Iron & Steel Co. Ltd.
William Beardmore & Co. Ltd.
Workington Iron & Steel Co.

OVERSEAS

Algoma Steel Corporation Ltd. (Canada)
Anglo American Corporation of South Africa Ltd.
Australian Iron & Steel Ltd.
Breedband N.V. (Holland)
Broken Hill Pty. Co. Ltd. (Australia)
Danish Steel
Indian Iron & Steel Ltd.
Turkish Iron & Steel Ltd.
Rhodesian Iron & Steel Co. (PVT) Ltd.
Tata Iron & Steel Co. Ltd. (India)

Over 4,000 MDX-type mill motors have gone into service during the last eight years in leading iron- and steel-producing works in Britain and many other parts of the world. They have established a good reputation for efficient and continuous duty. Remarkable reliability and strength, together with low inertia of rotating parts, make MDX motors ideal for driving a wide range of steelworks equipment. They have been specifically designed to withstand arduous service and are unaffected by heavy overloads. Available totally enclosed, up to 200 h.p., self-ventilated, up to 250 h.p.

Please write for further details to INDUSTRIAL MACHINES DEPT, TRAFFORD PARK, MANCHESTER 17

AEI

Associated Electrical Industries Limited

Motor and Control Gear Division

RUGBY & MANCHESTER

A5568

Around the world in 92 ways with

LASSO 92

PVC ELECTRICAL TAPE

for Insulation - Identification - Protection

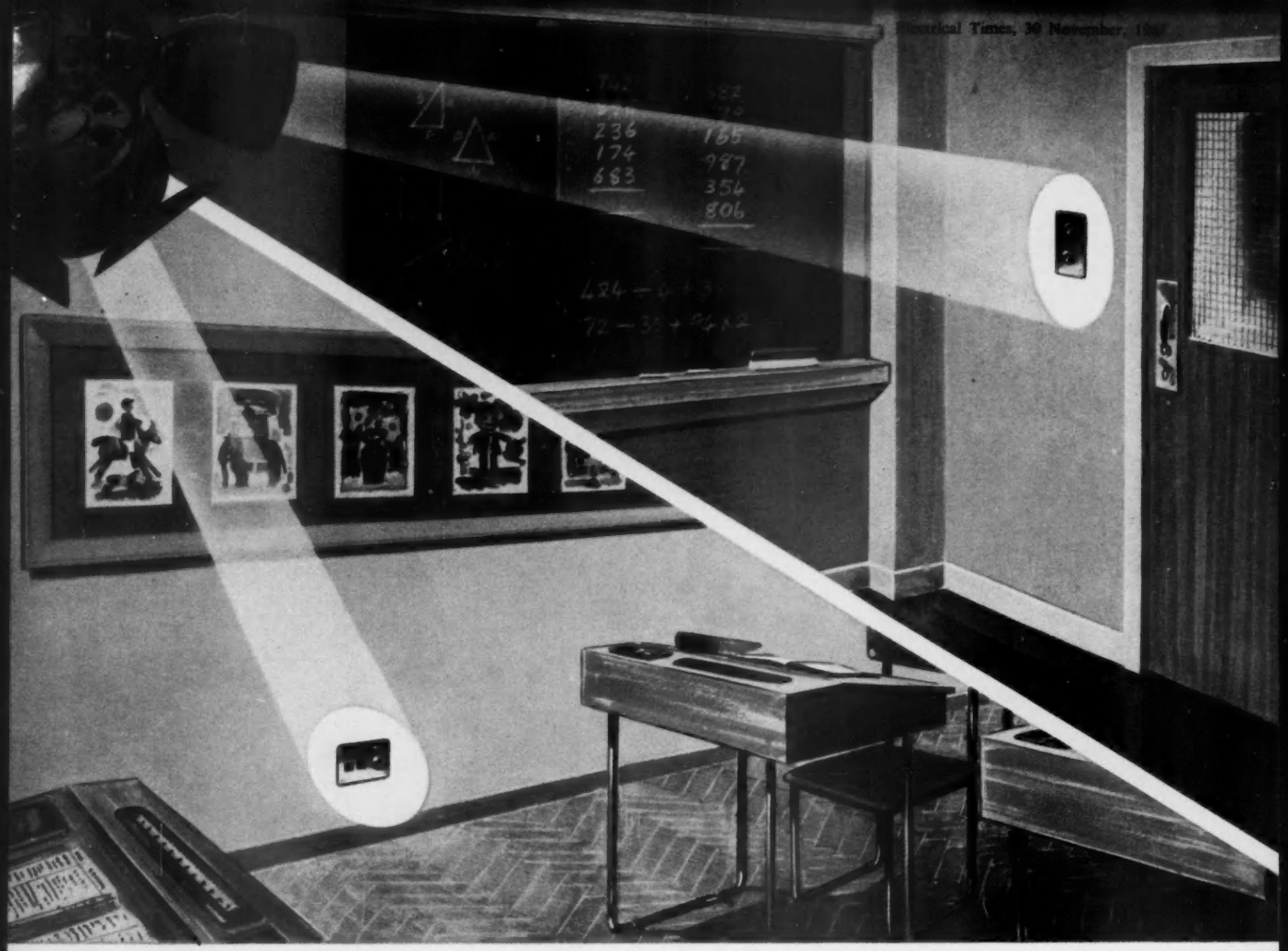
Lasso 92—the superb insulating tape. Strong and flexible, to seal and protect the most awkward joints and fittings. No. 92 has high electrical resistance under all circumstances. Quick and easy to apply. Ideal insulator of high voltage equipment under damp, oily and alkaline conditions.

A few of its many uses

- **Joining electrical cables**
- **Transformer assembly**
- **Colour identification**
- **Stopping-off in electroplating**

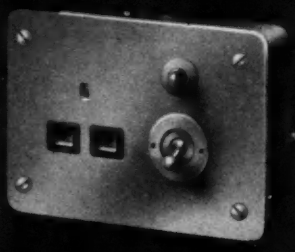
For fuller information on this very useful tape, please write to the address below, or telephone Welwyn Garden 25151.

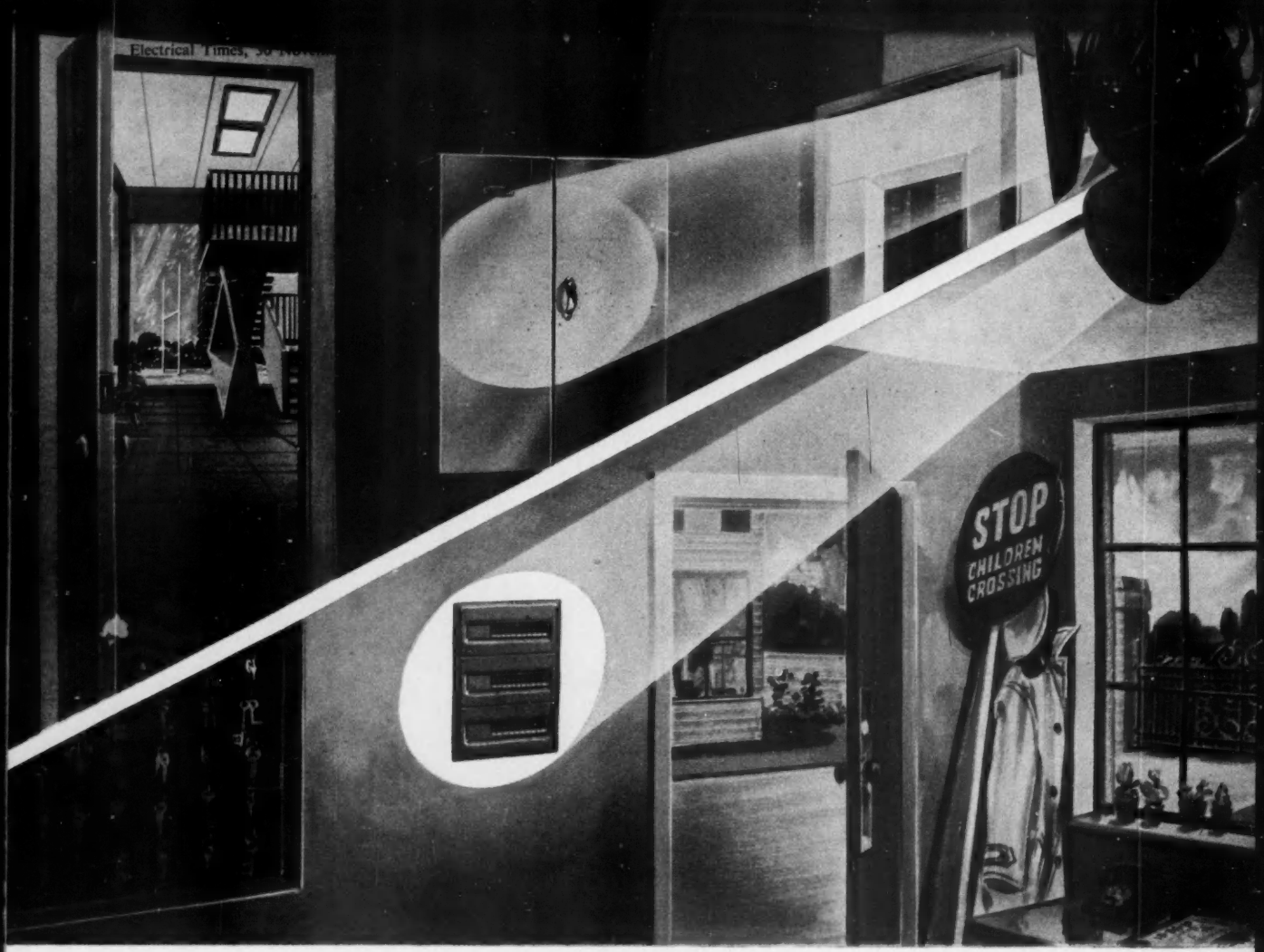
SMITH & NEPHEW LIMITED
WELWYN GARDEN CITY HERTS



SPOTLIGHT ON A GOOD INSTALLATION

The school installation must provide safe, reliable and continuous service. At the same time, the wiring accessories—those parts of the installation which could be handled by the children—must be robust and tamperproof. For these reasons, Crabtree circuit breakers are being increasingly specified for the protective

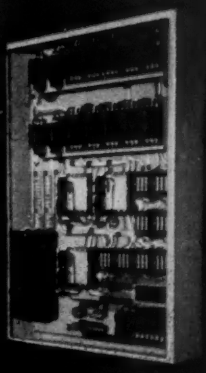




control of main and sub-circuits and Crabtree metal-plate assemblies with locking rings for all lighting and socket-outlet points. To install Crabtree throughout a school is automatically to ensure that the "moving parts of the installation" will last as long as the building itself.

CRABTREE

J. A. CRABTREE & CO. LTD., LINCOLN WORKS, WALSALL, STAFFS.



A METRAC LIVE LINE INDICATOR TAKES THE RISK OUT OF MAINTENANCE WORK

"DANGER LIVE"—the Metrac Live Line Indicator, for verifying the isolation of high voltage apparatus before working on it, gives a clear reading on an illuminated scale in the presence of an energised conductor. The Metrac is a one-hand instrument, weighing less than 2lbs., containing its own batteries. The model illustrated is designed for use on 33 to 275kV overhead lines, while a switchgear spout model is made for testing 22 to 66kV metalclad switchgear. No contact is made with the conductor as the instrument detects the electrostatic field set up by a conductor energised by an A.C. voltage. Use is not confined to overhead lines and switchgear —a Metrac should be on hand in all work involving high voltage system.

Sheet 255b gives the technical details

Please send for your copy

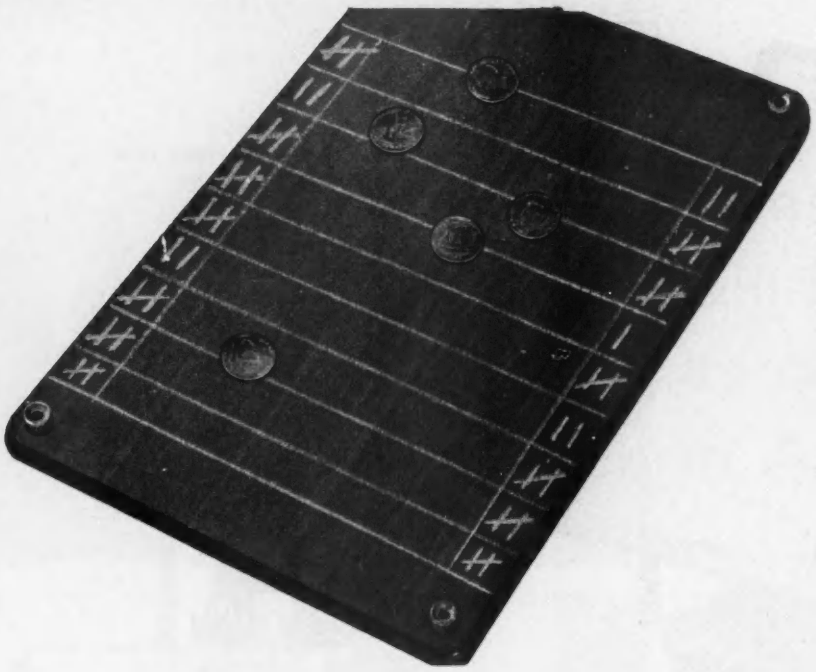
Other Products include : Timers · Synclock Motors · Metrohm · Metrans · Battery Charge Indicators · Recorders

EVERETT EDGCUMBE

METRAC

EVERETT EDGCUMBE & COMPANY LTD.
COLINDEEP LANE · LONDON · N.W.9.
Telephone: COLINDALE 6045.
BIRMINGHAM, CARDIFF, GLASGOW, LONDON, MANCHESTER, NEWCASTLE, SHEFFIELD.

PAM 693



Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON–the meter board people

WOOTTON & CO. LTD
ALMA WORKS · PONDERS END · MIDDX
Telephone: HOWard 1858

for

MICANITE

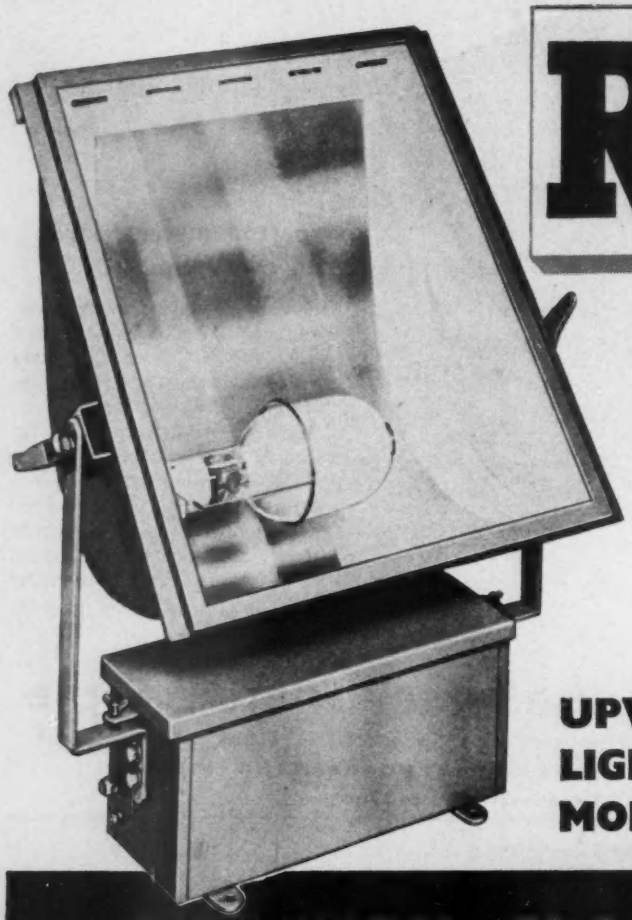
INSULATION

Consult

EAST LONDON MICA WORKS

RINGWOOD RD., WALTHAMSTOW, LONDON, E17
ESTD. 1912

Phone: COPpermill 2248/9
Telegrams: Elmicmer, Easphone, London



R E A L

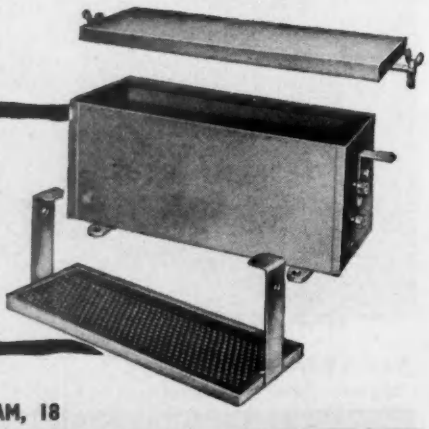
R.E.A.L. IS A REGD. TRADE MARK

UPWARD LIGHTING MODEL

MERCURY FLOODLANTERN

for 250/400 watt MBF/U Lamps

List No. 1231. This Weatherproof Lantern incorporates a Parabolic asymmetric Reflector 3° focus, and is suitable for short or medium range floodlighting of vertical surfaces.
It is just one of the R.E.A.L. range of Floodlanterns comprising some fifty models and catering for practically every type and size of lamp.

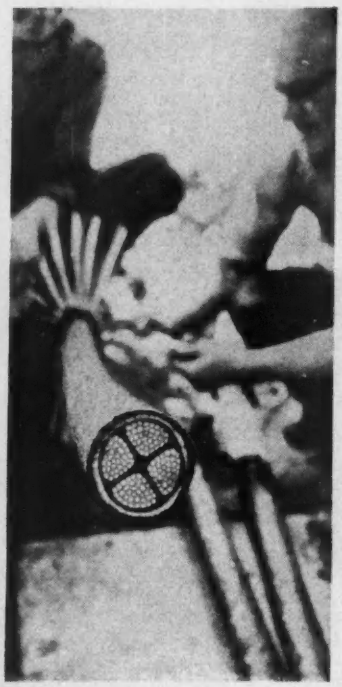


'UNIVERSAL' CONTROL GEAR BOXES

List No. 1209. The perforated tray supplied with the R.E.A.L. Box greatly facilitates gear mounting.
Each Box fitted with packed glands for incoming and outgoing cables.

Have you yet received your copy of LIST P.6004?

ROWLANDS ELECTRICAL ACCESSORIES LIMITED, R.E.A.L. WORKS, BIRMINGHAM, 18



These cables will be as good as new in A.D. 2011

These gangers and jointers are laying cables made with aluminium conductors. It's a sight that is becoming increasingly familiar in British cities, from London to Glasgow. It means power PLUS for homes, factories, offices and mines. The PLUS is Alcan aluminium in those conductors. They will still be carrying their load 50 years from now.

The gangers are installing 4 core ·3 sq. in. low-voltage distribution cables. Aluminium is also increasingly used in high-voltage and extra-high-voltage feeders. It has great advantages for the sheathing of pressure-type cables. Jointing presents no problems.

Today, aluminium is the cheapest conductor material. Alcan production capacity and Alcan research make sure that it will hold its lead.

Cable manufacturers can give you further advice on aluminium cables. Write to them, or write to us:
Alcan (U.K.) Limited,
Aluminium Canada House,
30 Berkeley Square, London W.1.
Telephone: Mayfair 9721.

ALCAN
ALUMINIUM LIMITED OF CANADA

Britain's most widely used aluminium — from Canada

ALCAN

she can't have one without the other

Most people want the comfort of modern amenities—but few like the towers that bring the power to work them. What's the answer? Return to lamplight, peat fires and the washing tub? Bury the power lines and do away with the towers altogether? Attractive idea—just possible too, but at 17 times the cost—with its inevitable effect on your electricity bill. For the foreseeable future, transmission towers must stay. But they cannot be planted just anywhere. An Act of Parliament charges the Central Electricity Generating Board with a double duty: to provide an efficient and economical electricity supply, while preserving visual amenity as far as possible. Power lines are planned with forethought—by men who are as anxious as you are to keep this land green, pleasant . . . and up-to-date.

■ These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.

CEGB

who make and supply electricity to 12 Area Electricity Boards in England and Wales (which re-sell to consumers) and British Railways.

Write or a copy o "Preserving Amenities" to The Central Electricity Generating Board, 76 Winsley Street, London, W.1

NEWS SHEET

Should Electricity Council have paid more respect to pay pause? Absence of Ministerial direction under 1957 Electricity Act raises doubts on Prime Minister's rebuke. (797)

Midlands EB launch plan for whole-house heating with time payment basis. No deposit and repayment over five years offered, by arrangement with Mercantile Credit Co., with interest of 5% after tax deduction. (822)

Should Electrical Engineers' exhibition be biennial? Organisers seek views of exhibitors on this change and whether the exhibition should be opened to foreign products. (822)

AEI and GEC complete glass lighting components integration. New jointly owned company, Glass Tubes and Components Ltd., will make and sell all glass components not already covered by the Glass Bulbs partnership. GEC also report further internal reorganisation. (823)

***Shoppers' Guide* reviews instantaneous water heaters;** three models tested all had "serious drawbacks." Unfavourable comment on television servicing as a result of trials with specially faulted receivers; door-to-door salesmen of electric central heating systems also criticised. (797, 823)

Network analyser assumptions in stability studies demonstrated acceptable by more precise studies, claims IEE paper account of electronic analogue computer techniques. Discussion suggests that digital computers will handle all such work soon. (807)

Only 4·6% increase in units sent out in October by CEGB, 9,311 million kWh; but S. Scotland EB increase 14·3% to 799 million kWh and N. Scotland 10·4% to 172 million kWh. Further 120 MW set for Skelton Grange with 860 klb/hr boiler. (821)

Electrical exports rise £3¾ million to £23·6 million for October. Imports reach record of £6·1 million including £2 million from US. (817)

PEOPLE—E. L. N. Towle promoted to manager, Industrial Applications Engineering Dept., AEI Motor and Control Gear Division . . . D. W. V. Parkes becomes director, Tricity Cookers . . . K. L. Murray to succeed K. Sutherland (retiring) as engineer and manager, Electricity Supply Dept., SEC of Victoria . . . A. Marshall becomes field sales manager, J. G. Statter and Co. . . . F.W. Shaw to succeed F. Hardman (retiring) as deputy chief accountant, Seeboard . . . N. R. Wheldon promoted to northern area manager, Electric Construction Co. . . . A. W. J. Hunt succeeds M. Clissold (retiring) as Lyndhurst district manager, Southern EB . . . P. Sydney to be Eastern EB chief commercial officer . . . I. G. Ellis becomes deputy chief personnel officer and J. F. G. Bland, education and training officer, CEGB . . . T. Yule, Southern chief project officer, CEGB, dies. (810-812)

she can't have one without the other

Most people want the comfort of modern amenities—but few like the towers that bring the power to work them. What's the answer? Return to lamplight, peat fires and the washing tub? Bury the power lines and do away with the towers altogether? Attractive idea—just possible too, but at 17 times the cost—with its inevitable effect on your electricity bill. For the foreseeable future, transmission towers must stay. But they cannot be planted just anywhere. An Act of Parliament charges the Central Electricity Generating Board with a double duty: to provide an efficient and economical electricity supply, while preserving visual amenity as far as possible. Power lines are planned with forethought—by men who are as anxious as you are to keep this land green, pleasant . . . and up-to-date.

■ These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.

CEGB

who make and supply electricity to 12 Area Electricity Boards in England and Wales (which re-sell to consumers) and British Railways.

Write for a copy of "Preserving Amenities" to The Central Electricity Generating Board, 76 Winsley Street, London, W.1

NEWS SHEET

Should Electricity Council have paid more respect to pay pause? Absence of Ministerial direction under 1957 Electricity Act raises doubts on Prime Minister's rebuke. (797)

Midlands EB launch plan for whole-house heating with time payment basis. No deposit and repayment over five years offered, by arrangement with Mercantile Credit Co., with interest of 5% after tax deduction. (822)

Should Electrical Engineers' exhibition be biennial? Organisers seek views of exhibitors on this change and whether the exhibition should be opened to foreign products. (822)

AEI and GEC complete glass lighting components integration. New jointly owned company, Glass Tubes and Components Ltd., will make and sell all glass components not already covered by the Glass Bulbs partnership. GEC also report further internal reorganisation. (823)

***Shoppers' Guide* reviews instantaneous water heaters;** three models tested all had "serious drawbacks." Unfavourable comment on television servicing as a result of trials with specially faulted receivers; door-to-door salesmen of electric central heating systems also criticised. (797, 823)

Network analyser assumptions in stability studies demonstrated acceptable by more precise studies, claims IEE paper account of electronic analogue computer techniques. Discussion suggests that digital computers will handle all such work soon. (807)

Only 4·6% increase in units sent out in October by CEGB, 9,311 million kWh; but S. Scotland EB increase 14·3% to 799 million kWh and N. Scotland 10·4% to 172 million kWh. Further 120 MW set for Skelton Grange with 860 klb/hr boiler. (821)

Electrical exports rise £3¾ million to £23·6 million for October. Imports reach record of £6·1 million including £2 million from US. (817)

PEOPLE—E. L. N. Towle promoted to manager, Industrial Applications Engineering Dept., AEI Motor and Control Gear Division . . . D. W. V. Parkes becomes director, Tricity Cookers . . . K. L. Murray to succeed K. Sutherland (retiring) as engineer and manager, Electricity Supply Dept., SEC of Victoria . . . A. Marshall becomes field sales manager, J. G. Statter and Co. . . . F.W. Shaw to succeed F. Hardman (retiring) as deputy chief accountant, Seeboard . . . N. R. Wheldon promoted to northern area manager, Electric Construction Co. . . . A. W. J. Hunt succeeds M. Clissold (retiring) as Lyndhurst district manager, Southern EB . . . P. Sydney to be Eastern EB chief commercial officer . . . I. G. Ellis becomes deputy chief personnel officer and J. F. G. Bland, education and training officer, CEGB . . . T. Yule, Southern chief project officer, CEGB, dies. (810-812)

NEWS SHEET

3·3 kV a.c. marine distribution systems substantially cheaper in cost and space, but official regulations await shipowners' initiative in launching pioneer installation. Economic advantages include direct starting of motors up to 200 h.p. on large ships. (798, 799)

Refrigerators and immersion heaters were best sellers in September in board showrooms; washing machines sales fall. Refrigerators 12% better than a year ago. RTRA report shading off in radio sales. (823)

ETU's new Executive stripped of many powers by Rules Revision Conference. Ballot procedure also changed. (824)

Electromagnetic forces applied directly for metal forming in US-developed technique. Discharge from capacitor produces high-intensity magnetic field, repulsion of metal part forces it on to former. (806)

One-sixteenth in. thick polythene sheet for hot line working is feature of technique developed in Hull sub-area, YEB, capable of handling replacement of poles on 11 kV lines without supply interruption. (798, 804)

2 MVA demand at BBC TV centre, may rise to 6 MVA with colour. IEE paper describes power installation. 750 kVA dry type transformers close to load concentrations with distribution now at 240 V. Main circuit-breakers controlled from central apparatus room. (798, 813)

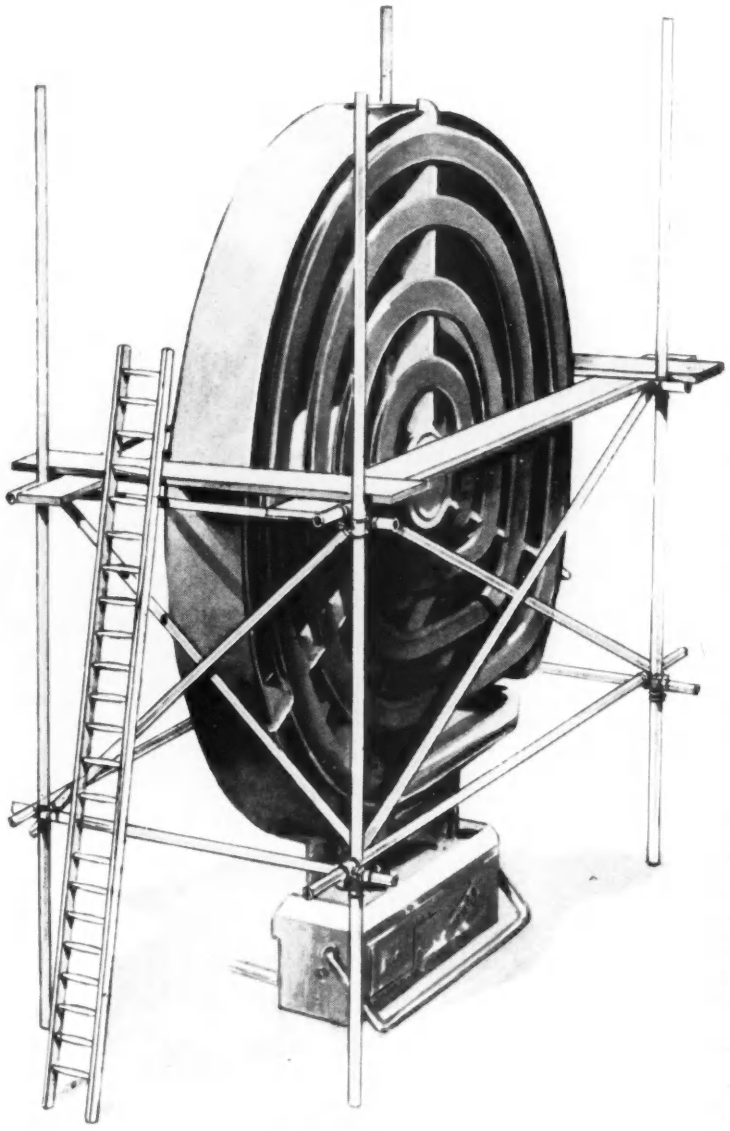
Permanent Magnets Association before RTP Court. Co-operative research may be abandoned if agreement is ruled against; patent sharing and technical information exchange will be lost. (822)

Low-set spark gaps permit smaller working clearances during live-line maintenance on e.h.t. systems. Recommendations for safety up to 460 kV detailed in AIEE paper. (815)

New BEAMA Directory launched to aid exports. Over 1,000 items classified with reference section in five languages including Russian. (824)

BUSINESS—Bowthorpe and Deutsch of California form partnership to make connectors (822) . . . AEI-John Thompson Nuclear Energy Co. acquire remaining shares in Nuclear Graphite Ltd., from Morgan Crucible (822) . . . Control of Brush Crystal passes to US (823) . . . Stock market shock when Lord Nelson retracts forecast of steady 10% dividend by English Electric . . . British Electric Resistance's turnover running 11% higher . . . Crabtree still expanding . . . Harland predict lower profits. (828)

OVERSEAS—BICC get £200,000 order for submarine cable link between Trinidad and Tobago . . . Hungary may use dry cooling system for 600 MW station . . . GEC of America to establish Indian factory . . . Plan for Ulima plant in Holland involves natural gas . . . Pakistan awaiting nuclear report. (829)



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NEWS SHEET

3·3 kV a.c. marine distribution systems substantially cheaper in cost and space, but official regulations await shipowners' initiative in launching pioneer installation. Economic advantages include direct starting of motors up to 200 h.p. on large ships. (798, 799)

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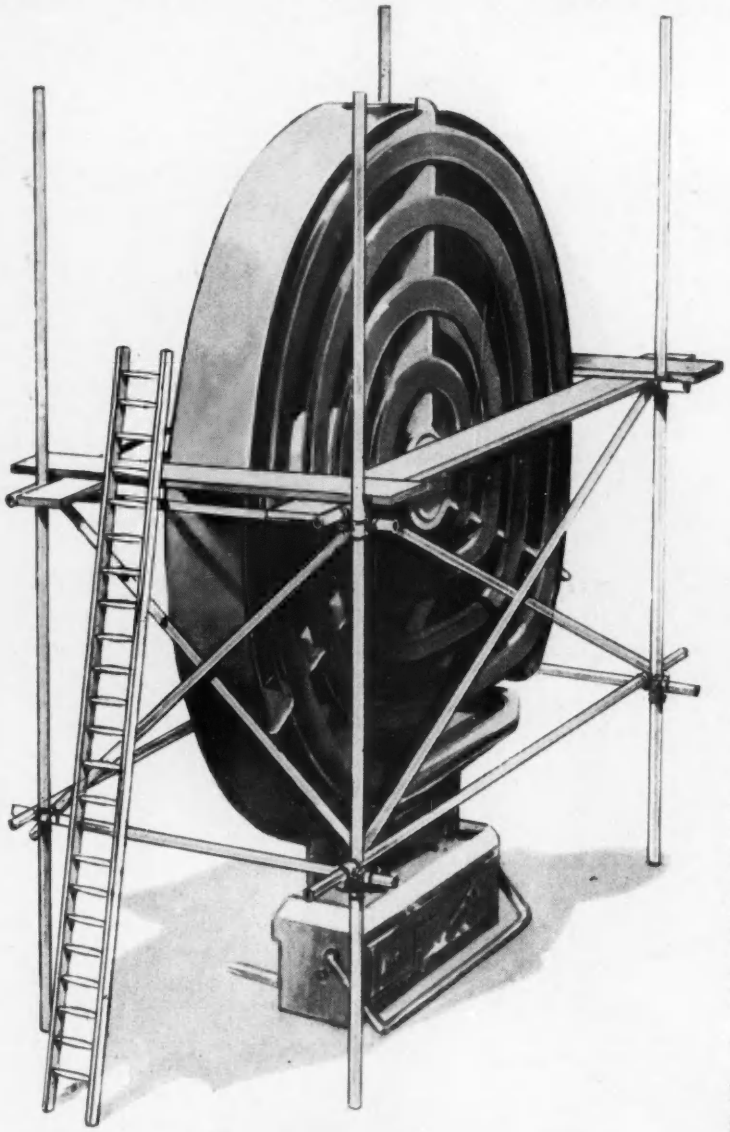

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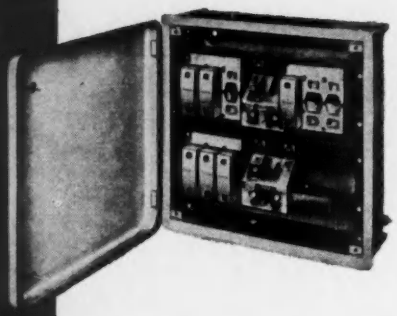

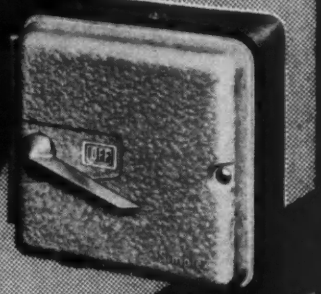

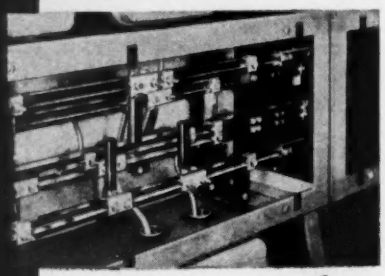

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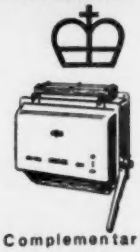

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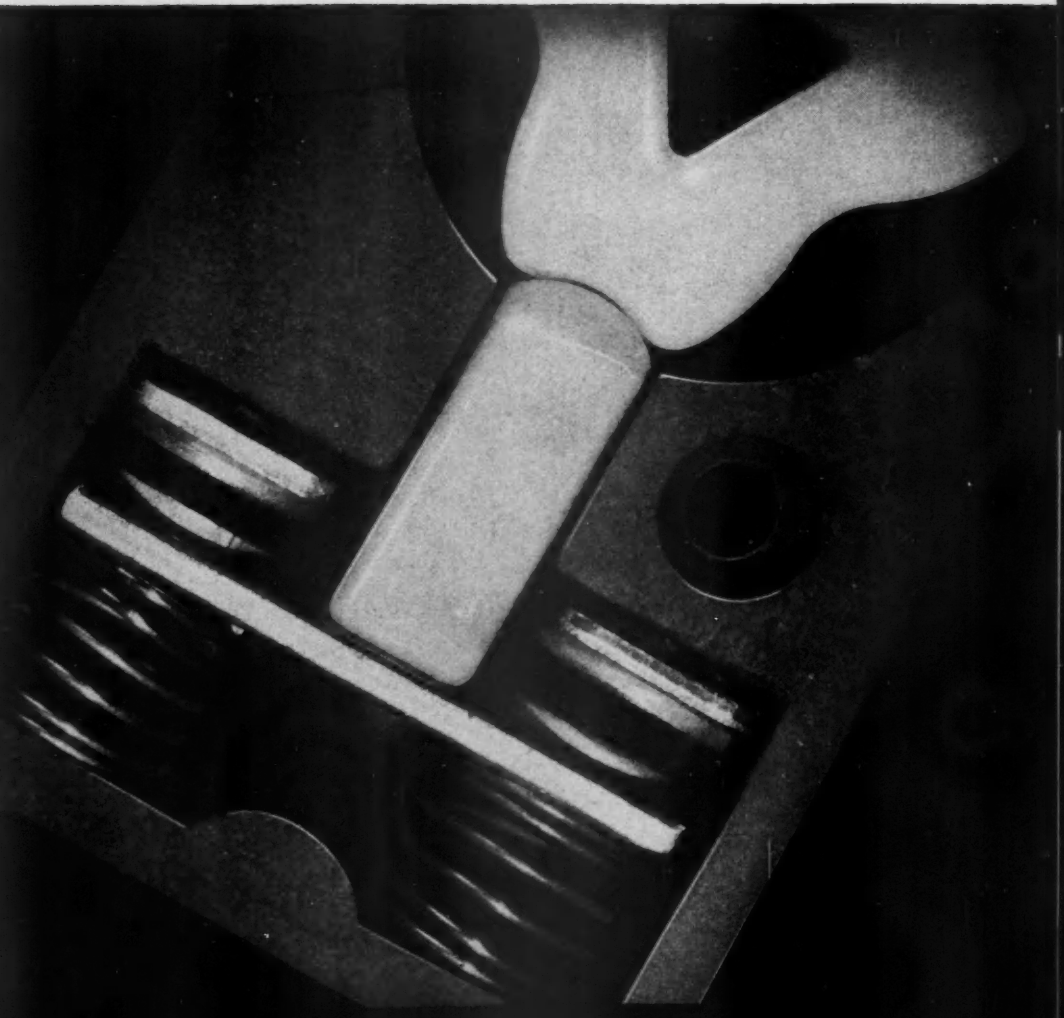

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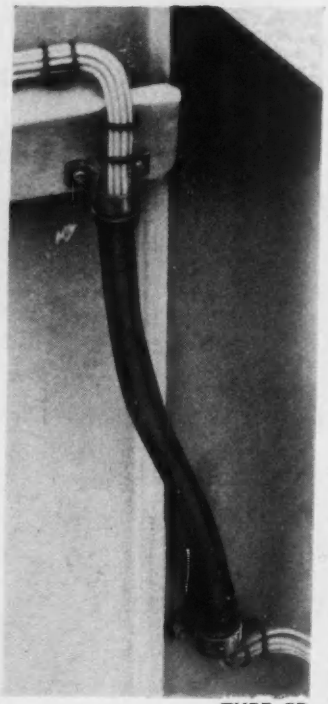

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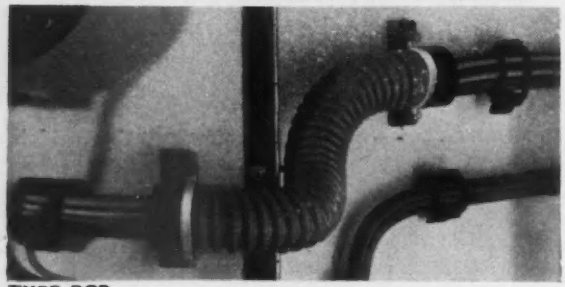

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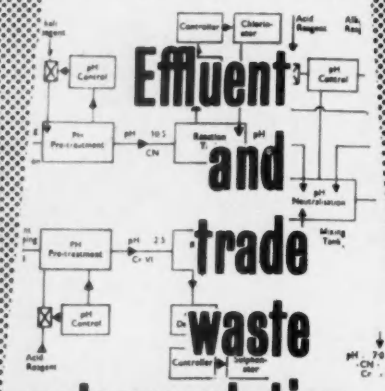

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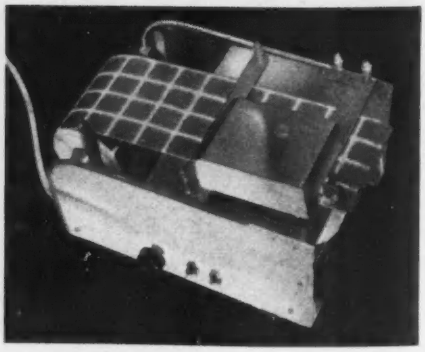

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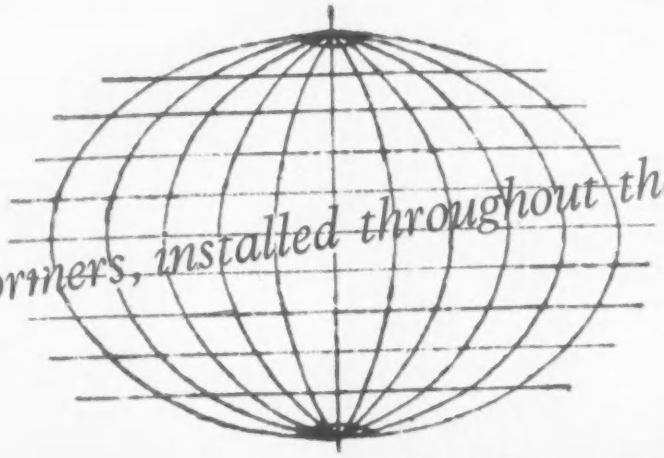

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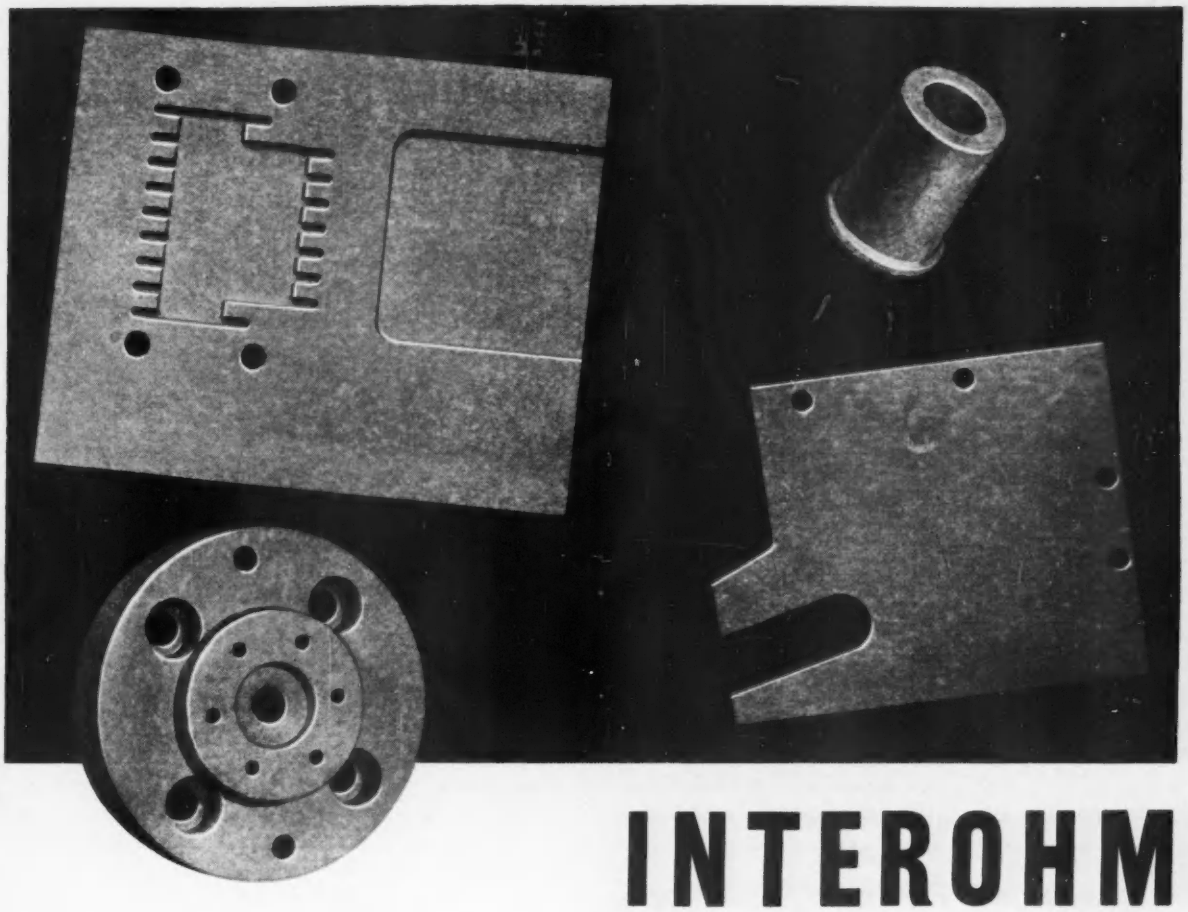

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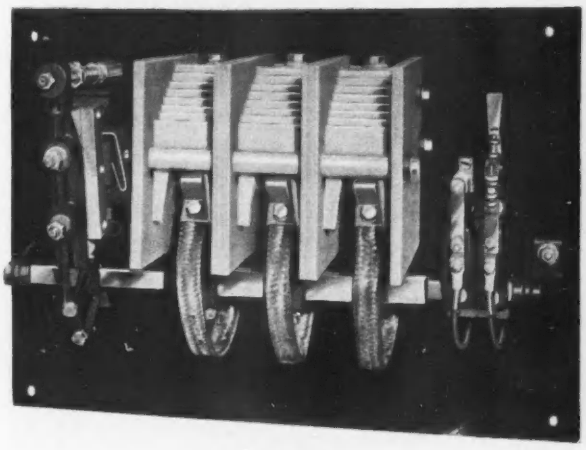

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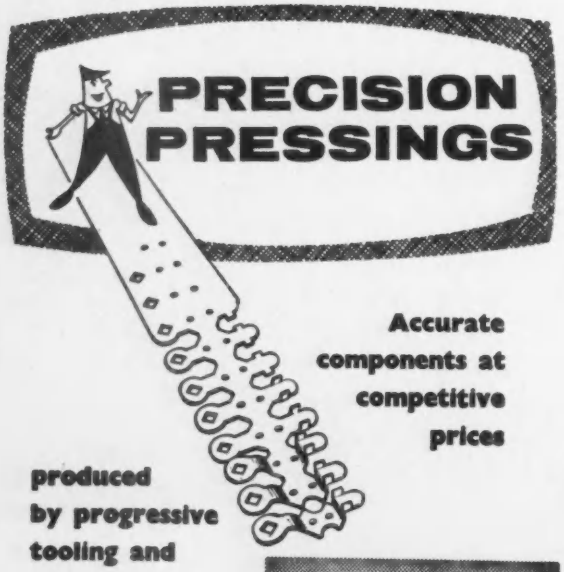

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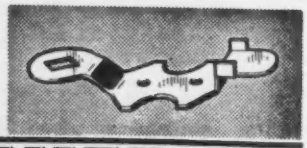

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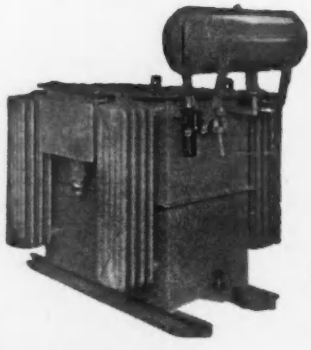

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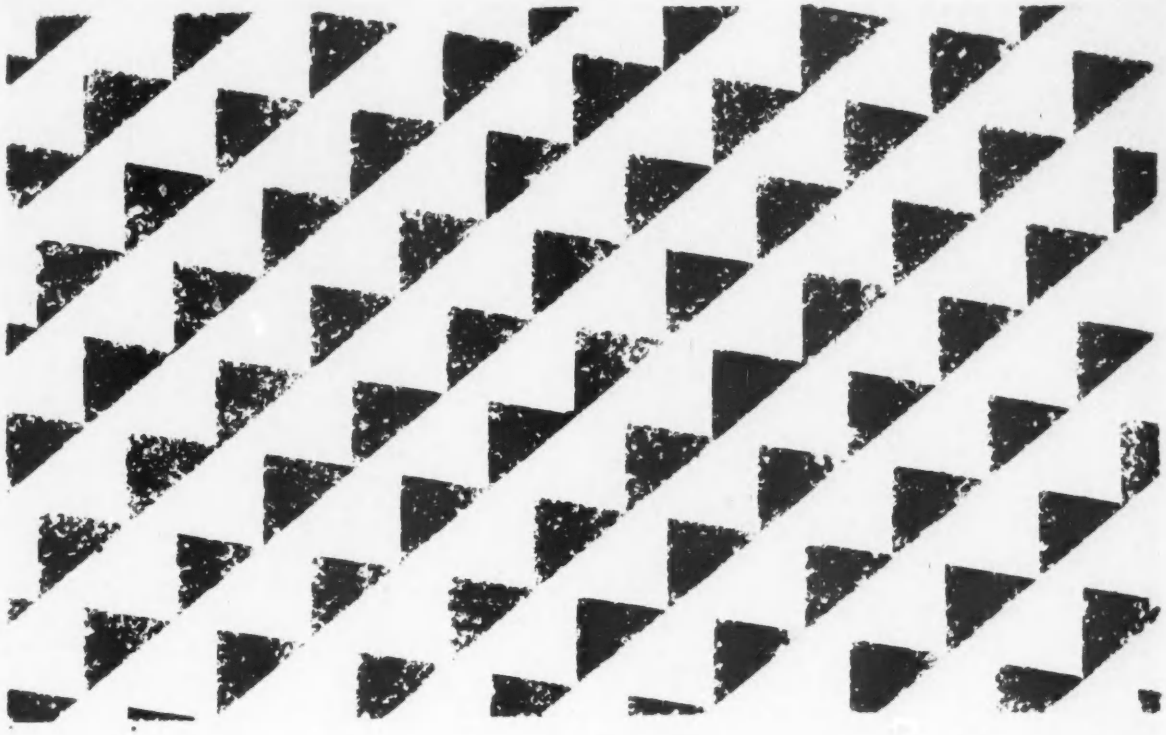

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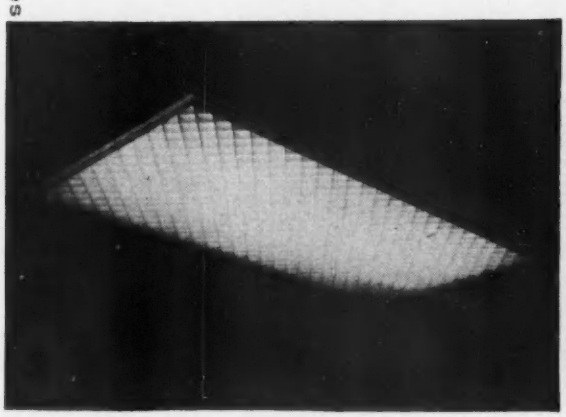

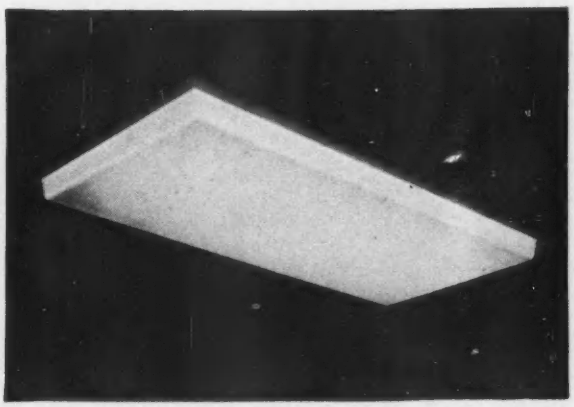

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AP 137

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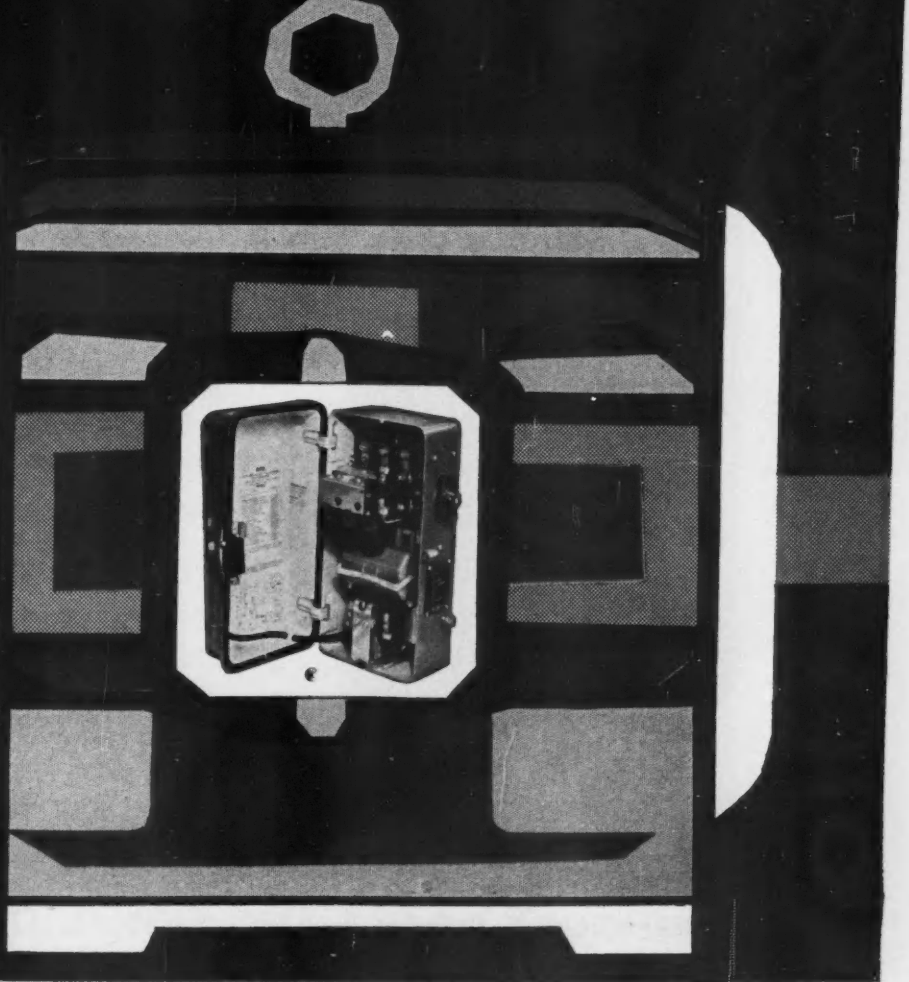

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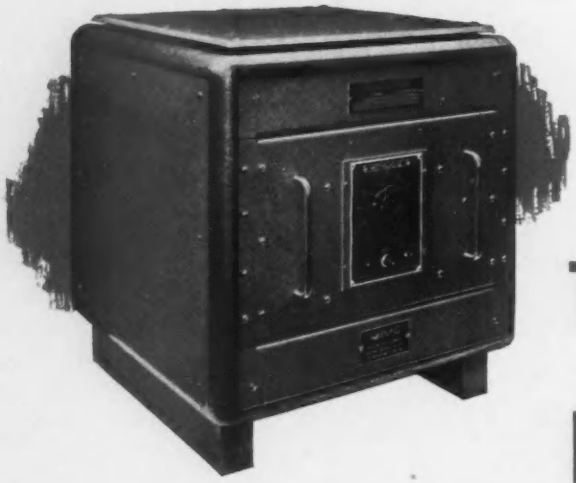

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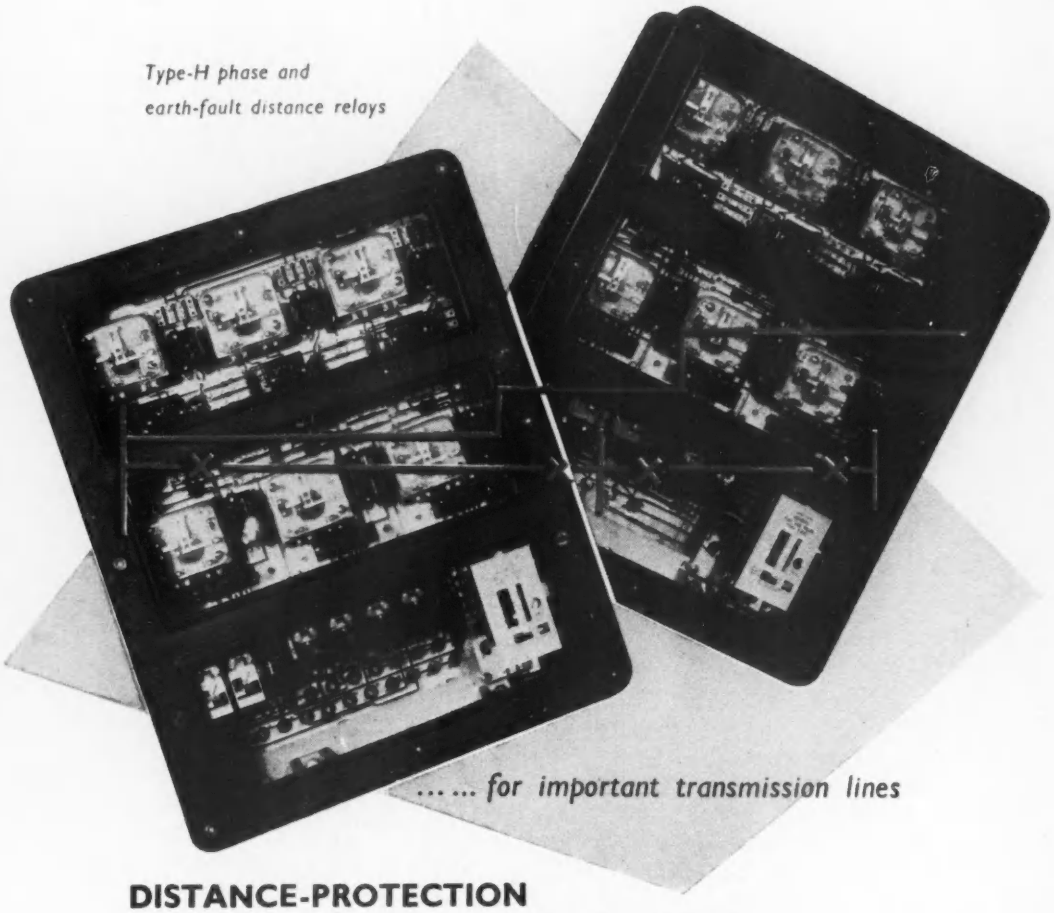

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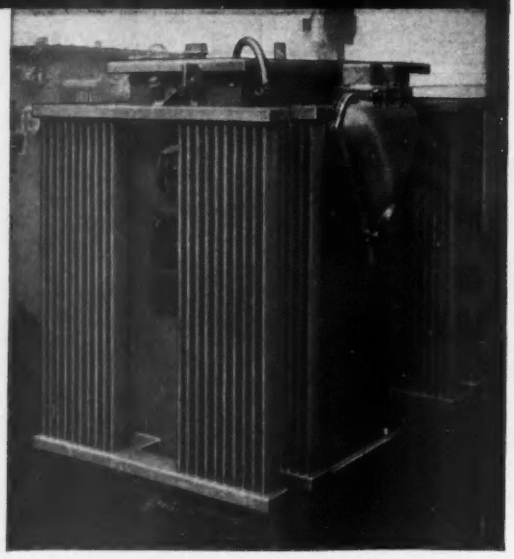

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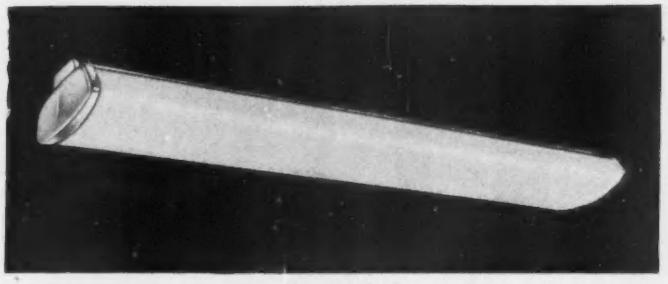

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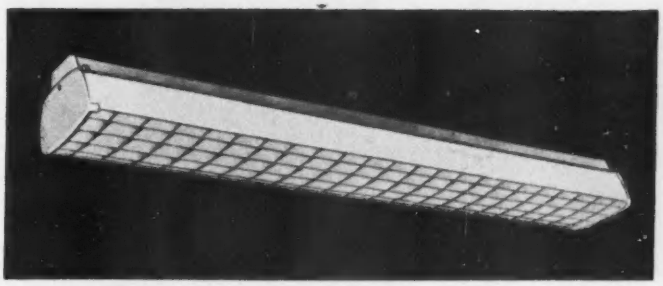

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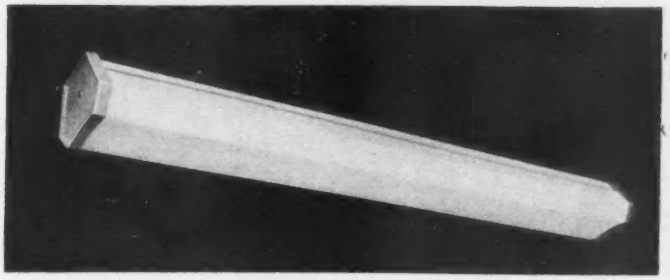

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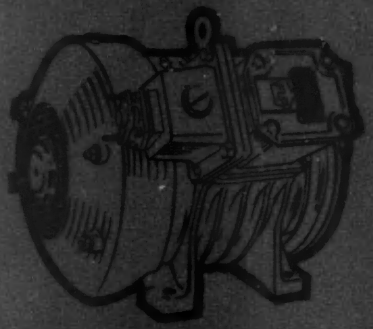

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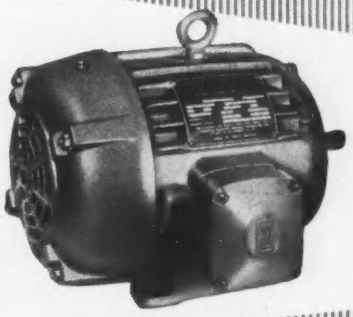

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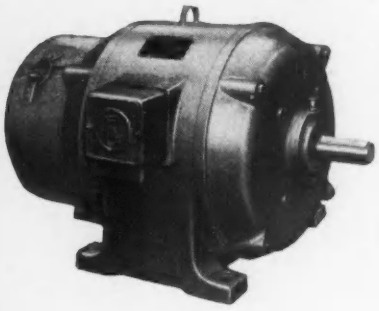

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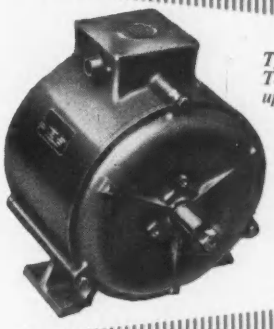

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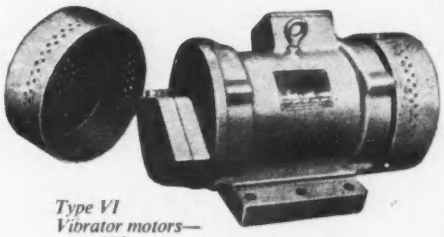

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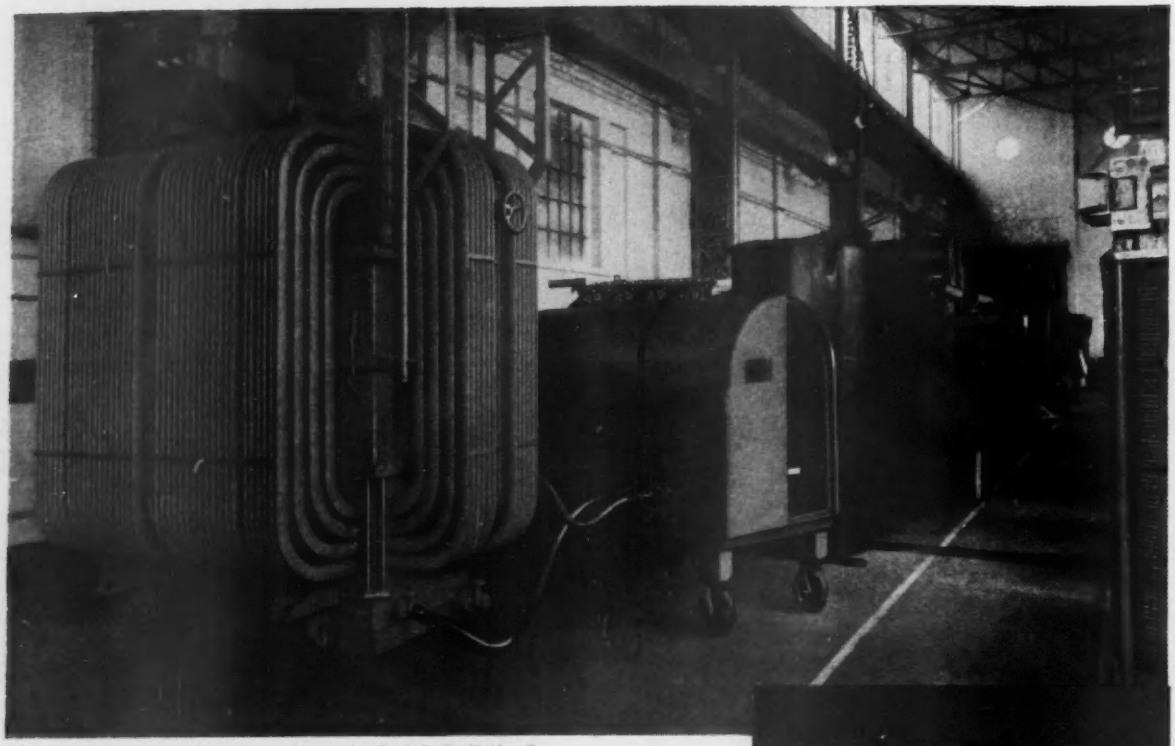
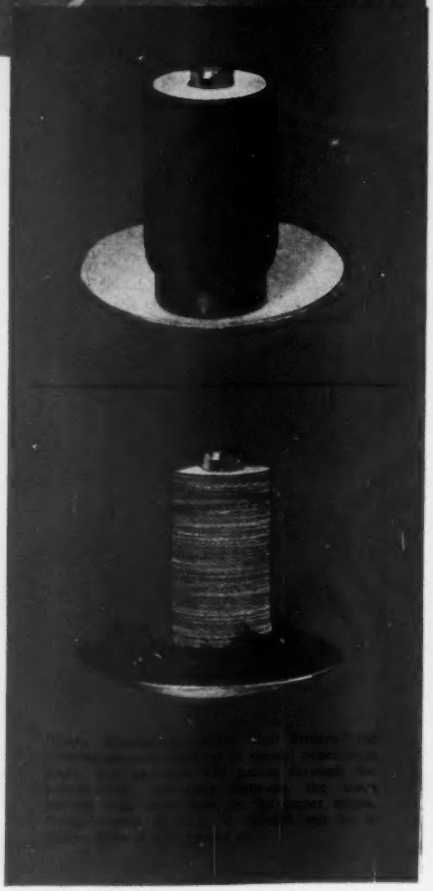


Photograph by courtesy of Bryce Electric Construction Co. Ltd., Hackbridge, Surrey.



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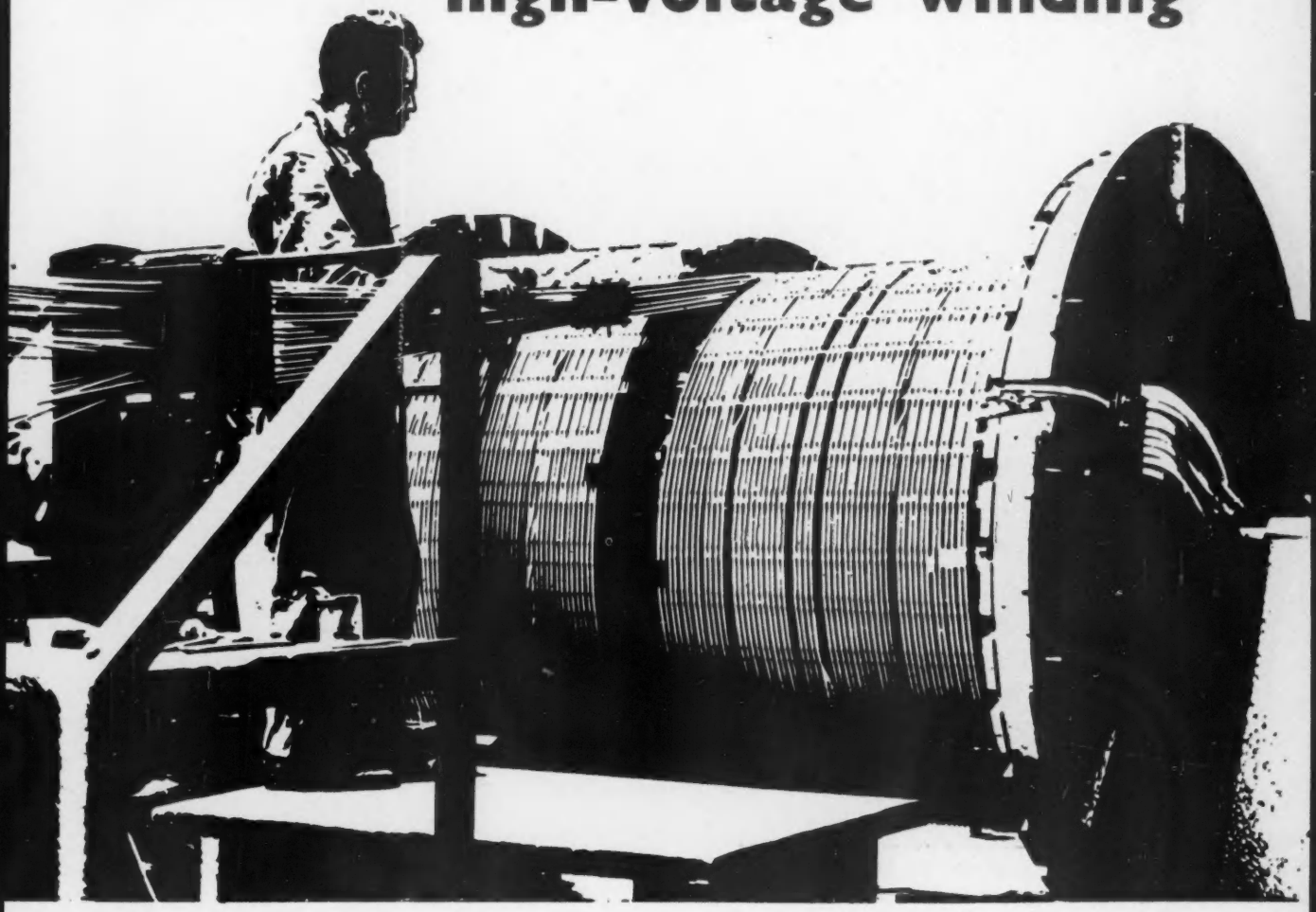

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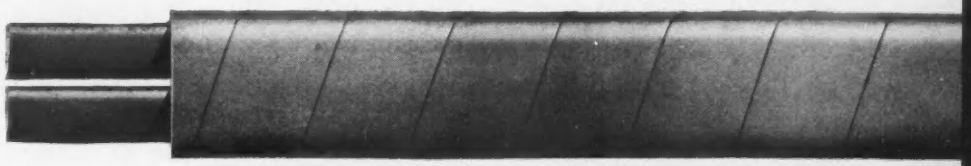

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THURSDAY 30 NOVEMBER, 1961
Registered as a Newspaper Volume 140 No. 22

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
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Marine A.C. Installations 799
by A. N. Savage, M.I.E.E.

Industrial Instrument Calibration 803

Hot Line Working at 11 kV 804
by H. Anderson, M.I.E.E., M.B.I.M.

Electromagnetic Metal Forming 806

Calculating Stability 807

Power for the TV Centre 813

Safety Clearances for Live Line Working 815

Forced Air Convection Heating for Flats 816

Dans ce numéro

Installations à courant alternatif à bord des navires 799

Les systèmes de distribution à courant alternatif à bord des navires sont d'habitude du type triphasé, à trois câbles, et à point neutre isolé. Les moteurs les plus pratiques sont du type à régime maximum et continu, et se servent d'un isolement en micanite ou en ruban de verre. Les moteurs doivent démarrer, dans la plus grande mesure possible, directement sur ligne; du point de vue chute de potentiel et l'effet porté sur l'éclairage, la limite peut se situer à 200 ch environ pour les moteurs à induction standard à cage d'écureuil. Une distribution à 3,3 kV sera vraisemblablement acceptée d'ici peu de temps. Il en résultera une économie d'espace, et il sera possible de faire démarrer de plus gros moteurs directement sur ligne.

Hypothèses dans l'analyse des réseaux 807

Lorsqu'on analyse un système d'alimentation afin d'en déterminer la stabilité, on effectue d'habitude un certain nombre d'hypothèses simplificatrices. Lors de l'étude d'un système à dix machines, on se servit d'une calculatrice analogique, et l'on prit en considération des facteurs généralement ignorés. L'inclusion de ces facteurs s'avère importante lorsqu'on étudie des systèmes fonctionnant près de leur limite de stabilité sous le contrôle de systèmes de régulation de tension à réponse très rapide. Toutefois, dans le cas des machines avec rotor à pôles non saillants dotées de systèmes d'excitation ayant une réponse passablement rapide, les études de la stabilité transitoire qui ont été effectuées avec les hypothèses habituelles d'analyseur de réseau ont donné des résultats sensiblement corrects.

Equipement pour le Centre de télévision 813

Le Centre de télévision de la British Broadcasting Corporation reçoit des alimentations de 11 kV. Trois sous-stations principales sont prévues en des endroits situés sur la périphérie du studio principal. La demande de consommation atteindrait 5.000 kVA pour la télévision en noir et blanc. Si la moitié des programmes étaient en couleurs, ce chiffre serait porté à 6.000 kVA.

In dieser Nummer

Wechselstrominstallationen auf Schiffen 799

Wechselstromverteilungssysteme auf Schiffen sind gewöhnlich Dreiphasensysteme mit drei Leitern, wobei der Nulpunkt isoliert ist. Die Motore sind zweckmässig vom Dauerhöchstleistungstyp mit "Micanite-" oder Glasbandisolierung. Die Motore sollten möglichst mit Startschaltung im Stromkreis arbeiten; vom Gesichtspunkt des Spannungsabfalls und seiner Auswirkung auf die Beleuchtung kann die Grenze bei normalen Käfiganker-Induktionsmotoren ungefähr bei 200 PS liegen. Die Verwendung von 3,3 kV Verteilungssystemen wird sehr wahrscheinlich bald akzeptiert werden. Dies wird sich platzersparend auswirken, und man wird dann auch grössere Motore durch Schaltung direkt im Stromkreis anlassen können.

Annahmen bei der Netzwerkanalyse 807

Wenn ein Kraftsystem zur Feststellung seiner Stabilität analysiert werden soll, legt man stets eine Reihe vereinfachender Annahmen zugrunde. Durch Verwendung eines Analogrechners konnte man beim Studium eines Zehnmaschinensystems Faktoren berücksichtigen, die im allgemeinen vernachlässigt werden. Die Berücksichtigung solcher Faktoren stellt sich beim Studium von Systemen als wichtig heraus, die im Bereich ihrer Stabilitätsgrenze arbeiten, und zwar mit Uberwachung durch schnell ansprechende, spannungsregelnde und andere Regelungssysteme. Schaltfestigkeitsuntersuchungen, die unter Zugrundelegung der normalerweise bei Netzwerkanalysen aufgestellten Annahmen durchgeführt werden, ergeben jedoch schlechthin korrekte Resultate, wenn es sich um Maschinen mit Läufern ohne ausgeprägte Pole handelt, deren Felderregungssysteme nur mässig schnell ansprechen.

Ausrüstung von Fernsehzentralen 813

Die Fernsehzentrale der British Broadcasting Corporation erhält Kraft mit einer Spannung von 11 kV. An gewissen Stellen ausserhab des das Hauptstudio enthaltenden Gebäudes befinden sich drei Hilfswerke. Für das Schwarzweissfernsehen wird der Verbrauch wahrscheinlich 5000 kVA erreichen. Würde die Hälfts der Programme in Farbe gesendet werden, so müsste dieser Bedarf auf 6000 kVA ansteigen.

FEATURES

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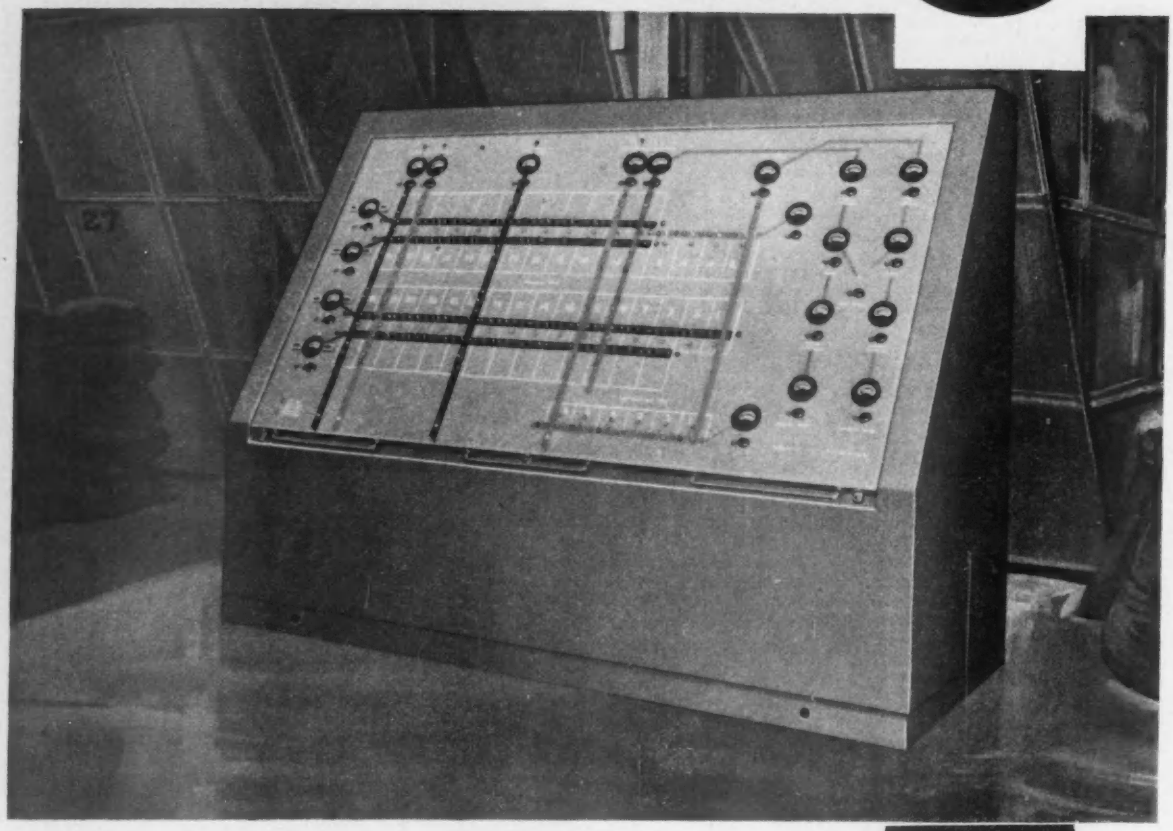
Bulk Storage Control Panel by... MEM



The panel is designed to control a number of conveyors operating a bulk storage plant consisting of 33 bins of 7½ tons capacity each.

Each bin has a pneumatically operated slide controlled by a solenoid operated air valve, making it possible to route material from any intake position to any one of the bins.

The panel comprises contactors controlling the solenoid air valves and starters with ammeters for the conveyor motors, dust extractor, etc. Full electrical interlocking of the conveyors and various safety features have been incorporated in the control circuits.

The mimic diagram on the sloping front of the panel gives a clear indication of the state of the plant which extends over an eight storey building. The position of the 100 slides is shown by means of indicator lights. In the event of any dangerous condition arising, an alarm signal is sounded and visible warning is given by flashing lights showing the position of the blockage.

The circuit was developed in co-operation with Mr. G. S. Carr, A.M.I. Mech.E., A.M.I. Plant E., Chief Engineer of Messrs. Crosfields and Calthrop Ltd., manufacturers of animal and poultry foodstuffs.

MEM

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 30 NOVEMBER, 1961

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T. W. WRIGHT

Comment

DIRECTION LACKING

Last week, the electricity supply industry had the unsought distinction of being publicly castigated by the Prime Minister for ignoring Government policy. Since then, the implications of the Electricity Council's pay settlement have been debated at enormous length. With so much talk from the national point of view, little attention has been given to the narrower supply industry aspects of the question. Yet it can surely be accepted within the industry that the Electricity Council took the action it judged in its corporate wisdom to be best for electricity supply. The Council, it has been insufficiently emphasised, had the courage to proceed along these lines despite the Minister of Power's expression of "great disquiet and anxiety" at its suggested pay agreement. However one judges the wage offer in the light of national economics, such independence argues welcome moral courage. Moreover, it called the Minister's bluff, if bluff it was: he issued no direction to the Council to enforce his opinions. There has been considerable argument about what could have been done to impose the Government's will. Presumably, the hope was that, left alone, the Council would pluck the pay-pause chestnuts from the fire. When it became clear that this was not so, the Minister had the right under the 1957 Electricity Act to

> "give to the Electricity Council . . . such directions of a general character as to the performance of their functions . . . as appear to be requisite in the national interest."

It is the whole basis of the debate on the pay settlement that the break in the pay pause affects the national interest. Therefore, the doubt about the practicability of direction lies, presumably, in an inability on the part of the Minister to bring sufficient generality to the idea of respect for Government policy in wage fixing. Yet if this is so, then there is a strong possibility that the Council would not have been statutorily entitled to let that policy override all other considerations. This is a point not tackled by the Prime Minister in his statement. What he did deal with was the question of responsibility. He seemed to place it firmly on the chairman of the Electricity Council, Sir Robertson King, rather than on the Council as a whole. It may be politically convenient to manoeuvre blame on to someone whose retirement is fixed for a few weeks ahead. From inside the industry it looks unrealistic.

SHARP SPEAKING ON SERVICING

Fault-tracing and repair is a contentious topic in any trade selling equipment with the "works" hidden from the user's eye. Neither customer nor service-man can

judge the time that will be required to find the trouble underlying particular symptoms, so the ground is well prepared for seeds of doubt about overcharging when the bill comes in. An attempt has been made to evaluate the position in one particular field—TV receiver servicing—by BSI Consumers' Advisory Council. The technique used should have the attention of electrical organisations that run repair services for any type of equipment. They may find themselves treated in the same *agent provocateur* fashion. In the BSI check, two simple faults were introduced into each of six identical TV sets. Six servicing firms were given the opportunity of putting the resultant trouble right. Only two found both faults; others partially corrected the trouble by manipulating pre-set controls. There was some evidence of charging for parts not replaced, and of the use of used parts charged at new prices. How true a picture this is of TV servicing is not the point at issue here, although the smallness of the sample must throw doubts on the application of the conclusions reached. The notable end result is publication of names and addresses in *Shoppers' Guide*, the Consumers' Council magazine. There is a clear invitation to action for libel if the comments in individual cases are unfair. Is there any likelihood that this technique for checking on repairers may spread into other electrical fields? It is an approach that is likely to be effective in detecting poor technical ability or gross opportunism in charging. Yet it carries a danger of improving repair quality at the price of increasing average costs. Is there room for the industry itself to evolve a checking procedure on repair work as it has done on manufacturing quality and on installation work through BEAB and NIC? There might be substantial advantages in this age of consumer coddling.

RURAL CONTINUITY

Recent years have seen a lot of work put into dealing with faults on rural systems in an effort to improve continuity of supply. Because there is reliance on overhead lines, operation of protective gear must be expected far more frequently than in town systems. The key factor in reducing the effect of faults is the transient nature of the great majority. Commonly, arcs between conductors or to earth are involved, initiated by lightning surges, birds, or wind-blown debris. Interrupt the voltage for a few cycles and the circuit is healthy again. Introduction of fast-acting, automatic-reclosing circuit-breakers, pole- or ground-mounted, has been remarkably effective in this respect. But any improvement through this sort of development places more emphasis on another cause of supply interruption in rural areas: maintenance work on overhead lines. If a line has to be made dead there is rarely a chance of an alternative supply, for it is uneconomic to provide much interlinking of rural circuits. An answer to this side of the continuity problem is being found, however, in the enormous extension of hot-line working that has taken place in the last year or two. One aspect of this is exemplified in an article we publish this week, which brings a reminder that jobs as formidable as pole replacement are being tackled without de-energising conductors. Another approach coming within the same field of development is the use of temporary runs of plastics-insulated cable to by-pass sections of line on which extensive work has to be carried out—a technique that is the subject of another article shortly to be published. All this effort builds up into better treatment for the rural consumer in that pre-eminent supply desideratum, continuity.

POWER FOR COLOUR

Broadcasting is reckoned as light-current electrical engineering, but the IEE paper presented last week on the BBC TV Centre demonstrates that when all the facilities required for TV production are taken into account another picture is painted. When the site is complete, maximum demand is likely to approach 5,000 kVA. If all the talk about colour television terminates in as high a proportion as half the programmes being in colour, the demand could rise to 6,000 kVA, for colour TV can take three times the lighting power required for black and white.

VOLTAGE AFLOAT

The probability that 3·3 kV will have to be used for shipboard distribution systems has been much discussed in recent years. There are strong technical arguments for going to this voltage, to cut down the space occupied by cables and to ease motor starting surge problems. One of the principal considerations arguing against the move from the 440 V a.c. now well established is the absence of detailed regulations. The various codes that apply to wiring in ships do not explicitly prohibit 3·3 kV; but they mark it off as something special. Lloyd's Register Rules, for example, set 500 V as the maximum acceptable, but add a clause that in "very large alternating current installations" generation and limited distribution at higher voltages may be submitted for special consideration. The fourth edition of the IEE Ship Wiring Regulations, issued a few months ago, limits itself to voltages up to 650 V. In the words of the author of our ship-distribution article this week—himself a member of the IEE Regulations Committee—no one will move to the precision of regulations until a shipowner has carried out a job and experience has been obtained. Who will be first? The plan for the third *Queen*, now abandoned, would have provided an obvious call for the higher voltage. Now it is less likely that sheer size in a passenger vessel will force the pace. Perhaps the growth in electrical requirements, which shows little signs of moderating, will impose the move. There has been very little official codification of requirements for high-voltage installations, even ashore. Anything evolved for shipboard use will hence have added interest.

This week's quick summary of electrical news faces advertisement page 12

Marine a.c. installations

ECONOMIC ADVANTAGES OVER D.C. IN MODERN SHIPS

by A. N. Savage, M.I.E.E.*

ALTERNATING current has now been accepted for marine installations and the number of such installations is steadily increasing. Sufficient descriptive articles have already been published; it is the intention of this article to put forward the fundamental differences between marine and industrial installations and also the factors which influence the design of ship installations.

Choice of Distribution System

Each marine installation is an entity in itself. While it must conform to recognised rules and regulations, it is not tied down to the existing standards which apply to shore installations.

The permissible systems are:

(1) 3-phase 3-wire insulated.
(2) 3-phase 3-wire with neutral earthed.
(3) 3-phase 4-wire with neutral earthed but without hull return.

Standard voltages are 115 V, 240 V and 440 V, with a maximum of 500 V. Generation with limited distribution at voltages up to 3·3 kV are also considered suitable in large installations.

Whilst Germany favours the 3-phase 4-wire system with neutral earthed and with hull return for secondary distribution, the remaining maritime countries prefer the 3-phase 3-wire insulated. The latter system is now the generally accepted one.

It is well known that a line-to-earth fault on an earthed neutral system causes the faulty circuit to be isolated through either the fuse or circuit-breaker operating, or through the operation of an earth-leakage relay. Such an interruption would cause inconvenience ashore but, on a marine installation, interruption of supply to a vital service such as steering gear, engine room pumps for main engines and generators, could in certain circumstances be catastrophic.

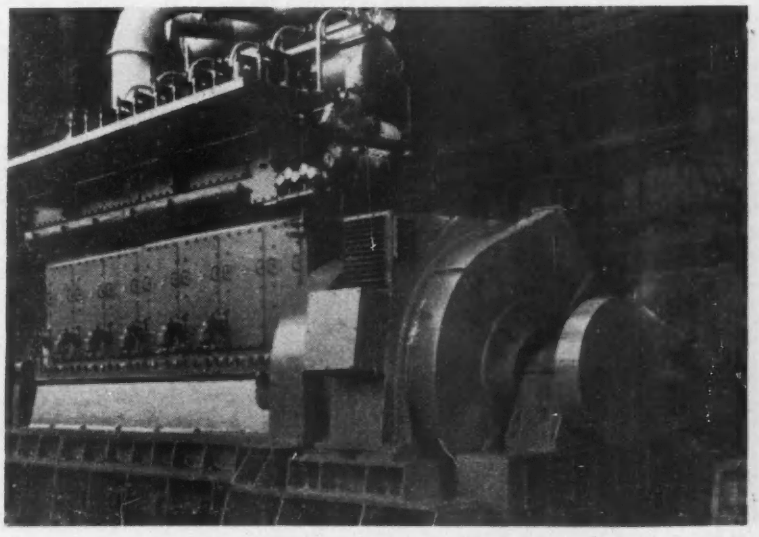
With an earthed neutral system fuses alone cannot give adequate earth fault protection. If we take a simple example of a resistance load connected across two lines of a 440 V supply, if one line becomes earthed the line fuse will blow but the circuit will remain energised at phase voltage of 254 V and current will continue to flow, via the earth path, to neutral. In the case of a high-impedance earth fault, fault current may flow without being of sufficient magnitude to rupture the fuse. Both types of fault constitute a fire hazard. It is therefore essential that a close routine for the observation and clearance of earth faults which may develop must be maintained on an insulated system.

Again, rules and regulations allow for a choice of either a 50 c/s or 60 c/s frequency. In general, 60 c/s has been adopted for marine installations, the reason being that 60 c/s gives a synchronous speed of 1,800 r.p.m. on 4-pole machines, compared with 1,500 r.p.m. at 50 c/s. This not only results in less weight and space occupied—and, incidentally, these are vital factors on shipboard—but it also lowers the cost of certain motor-driven auxiliaries.

To reduce the cross-sectional area of copper conductors as far as possible, all galley and hotel resistance loads should, wherever practicable, be supplied at 440 V. Range boiling plates and ovens rated down to 4·5 kW have been found to operate quite satisfactorily at this voltage.

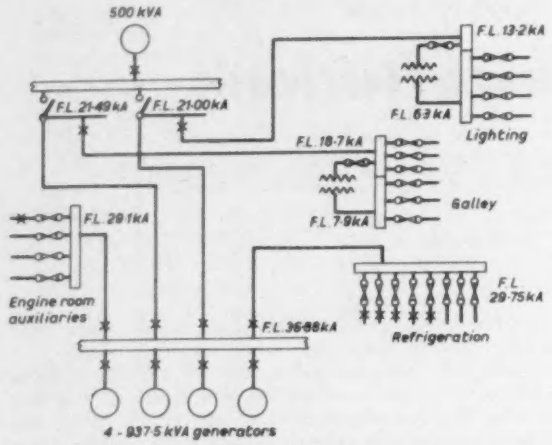
Regulations permit the use of liquid-cooled transformers but, in general, the ratings for shipboard service are relatively small and should be of the air-cooled type, so eliminating the risk of fire, explosion or the emission of toxic fumes under fault conditions.

It might be thought that one relatively large transformer need only be provided to supply each major 240 V circuit. This is not so. It is necessary to divide the installation into "essential" and "non-essential" services. The former are those which are essential for safe navigation and propulsion. On overload or generator fault conditions, the non-essential services are shed in order of priority until the demand is within the capacity of the generator or generators on the board, so ensuring continuity of supply to essential services. Non-essential services may be divided into three categories and this calls for a number of transformers, each sited at its appropriate load centre.



One of the 937·5 kVA, 440 V, 3-phase, 60 c/s diesel driven alternators for the RMS "Amazon" on test. For a diesel engined liner, a diesel generator is the obvious choice; it also has merits on turbine driven liners where one unit should be diesel driven to serve when boilers are shut down

* Chief Electrical Engineer, Royal Mail Lines.



Representative fault levels to be expected and entered for on a 3,750 kVA, 450 V, 3-phase distribution system

Table "E," Section 7 of the fourth edition of the IEE Regulations for the Electrical Equipment of Ships, gives preference for 55 V from socket-outlets where extra precautions against shock are desirable. Appendix 2 of these regulations gives notes on the choice of voltages for socket-outlets for use with portable a.c. appliances; 240 V socket-outlets are quite safe in passenger and crew accommodation which, to all intents and purposes, are insulated spaces. In other situations the voltage should not exceed 55 for portable tools, handlamps, cargo clusters, etc. Where the rating of a portable tool is such as to be cumbersome at 55 V, a 240 V appliance can be quite safely operated through a one-to-one ratio isolating transformer.

Domestic items of equipment such as refrigerators, boilers, hotplates, washing machines, toasters, etc., which are normally supplied with a standard length of flex, should be permanently wired and so eliminate the fitting of socket-outlets. The IEE regulations are not mandatory, but when the 1960 Safety of Life at Sea Regulations are ratified, a limiting voltage will become compulsory.

Short-circuit Fault Levels

With the adoption of a.c., the question of short-circuit current values has come to the fore. Previously, in d.c. installations, scant attention has been given to this point. Feeder cables on ships can be, and often are, of large cross-sectional area and short in length, the length of feeders being measured in feet, rather than in yards or miles as may apply ashore. Limitation of short-circuit currents by feeder reactance and resistance may be small for some feeders or appreciable in others. Calculations must be made to ensure that protective devices installed are of the appropriate breaking capacity, it being just as poor engineering economics to fit devices with too large a breaking capacity as it is poor engineering practice to fit devices with insufficient breaking capacity.

Another factor is the motor contribution to a fault current. Both T.C. No. 18 of the IEC and Lloyd's Register give the value of this transient contribution as three times the full-load current of all motors normally in service. This may, of course, have decayed before the circuit-breaker has time to operate, but its asymmetrical (peak) value will be present on "making."

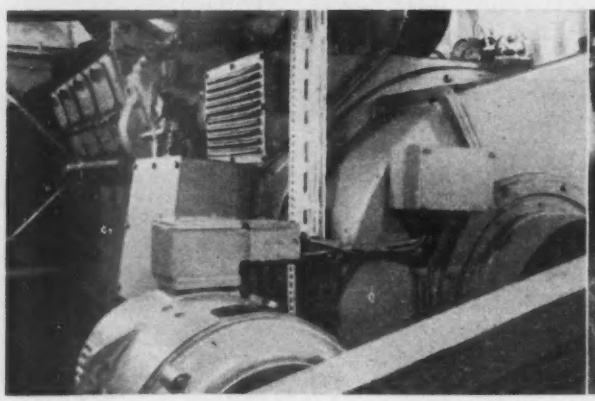
Again, a marine installation is a dense and closely knit system and the ratio of resistance to reactance will be small, so a high degree of asymmetry can be expected. In these circumstances it may be that the "making" capacity is the deciding factor when selecting protective devices.

With the deletion of an upper limit of 300 amp fuse rating from the rules where fuses are installed for short-circuit protection only, as in the case of motor circuits, fuse-switches may now be fitted where previously a circuit-breaker might have been considered necessary. The fuse-switch must be capable, however, of "closing" on to a fault current of not less than the cut-off value of the fuse. In certain isolated cases it may be found necessary to fit h.r.c. fuses in lieu of circuit-breakers for short-circuit protection in order to limit the fault energy to within the thermal capacity of the cable.

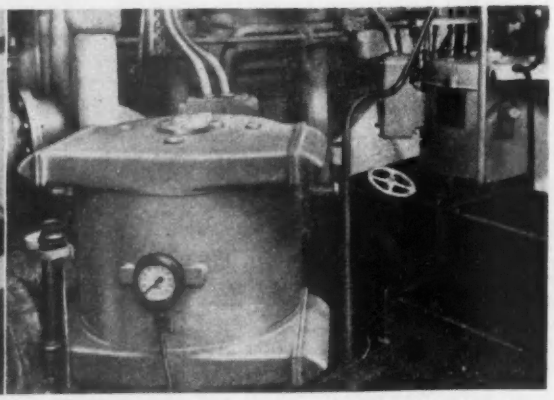
Motors and Control Gear

C.M.R. motors and generators have now been recognised as being suitable for marine purposes and it would have to be an exceptional motor which could not be started by direct-on switching. From experience gained, Class "B" insulation is the most satisfactory for c.m.r. machines. Incidents have arisen where machines have "single-phased" and the single-phase preventer has been rendered inoperative due to other causes. The fact that these machines were running single-phase was only noted when smoke was observed issuing from them, but they were allowed to cool down and then brought back into service. They were found to be sound and entirely satisfactory.

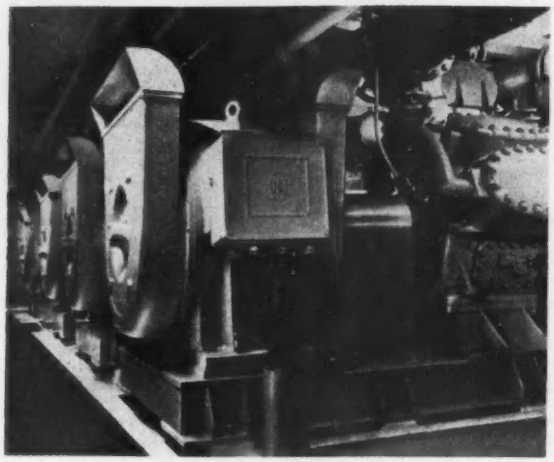
Class "B" insulation, comprising micanite and glass tape, can withstand a temperature far in excess of the 110°C allowable by BS 2949:1960. Single-speed motors driving auxiliaries have proved quite satisfactory.



500 kVA, 3-phase, 60 c/s, 450 V, 720 r.p.m. auxiliary diesel alternator

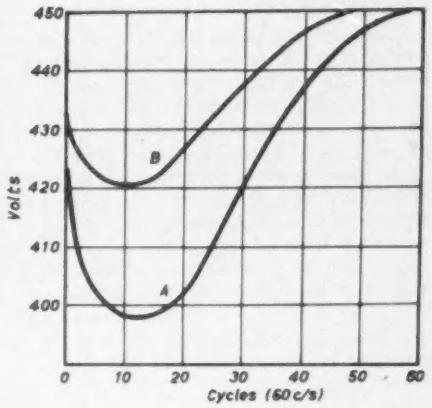


110 h.p., 3-phase, direct-on started, lubricating oil pump motors



These four compressors are driven by 200/143 h.p., 2-speed, 3-phase squirrel-cage motors

Voltage transients with direct-on starting of 200/143 h.p. s.c. motors. A, 937·5 kVA system; B, 1,875 kVA system



By adopting c.m.r. single-speed 60 c/s motors with Class "B" insulation, a reduction in cost of between 50% and 60% and a similar reduction in weight together with an appreciable reduction in space occupied can be achieved in comparison with the old standard practice of installing 220 V d.c. motors with Class "A" insulation having a sustained overload of 25% for two hours.

Other economies can be effected by the use of direct-on starting. How far one may adopt direct-on starting depends solely on what percentage of transient voltage change can be tolerated. The most critical type of ship in this respect is the high-class passenger vessel. Again from experience, it has been found that a voltage change of 7½% is quite satisfactory and does not cause adverse comment. In the case of fluorescent lighting, which is growing in popularity, the effect of such a voltage change is nil. If it is decided to design for a lower percentage change, it means reverting to auto-transformer starters with higher capital and maintenance costs and a lower standard of reliability.

Direct-on Starting

One of the greatest advantages of an a.c. system is that squirrel-cage motors with simple "direct-on-line" starters can be used; it seems a pity we have installations where this advantage is not exploited to the full. In some, 100 h.p. has been given as the highest permissible rating for direct-on starting, motors above this having to use auto-transformer starters. A double-cage motor of 300 h.p. or a standard squirrel-cage motor of 200 h.p. could be direct-on started quite satisfactorily. What is required today is a little more clearer thinking on the subject.

First, not only must the generating capacity normally on the board be considered, but also the value of generator subtransient reactance. The lower the percentage reactance, the lower percentage voltage change, but the lower the reactance the greater the generator fault MVA. There comes a time, as the total generating capacity increases in the larger installations, when the relative size of the largest motor to be dealt with tends to decrease, and the voltage change problem becomes comparatively unimportant. In such installations the value of reactance should be of the order of 13% to 14% to limit the fault MVA.

In smaller installations, where the percentage voltage change becomes the dominating factor, self-excited, self-regulating generators can be installed with advantage. The direct compounding of the rotor by rectified load current reduces the voltage change; at the same time it decreases the subtransient reactance and therefore increases the fault MVA of the machine. Although this is an unwanted effect, it is of secondary importance in the smaller capacity installations.

Secondly, where it is desired to retain direct-on switching for the exceptionally large motor (again relatively), a low starting current machine may be used.

The question of transient voltage changes has become such an obsession that an installation has been proposed in which the capacity from conventional generators is large enough for the biggest motor to be started direct-on without excessive voltage drop, yet auto-transformers are called for on motors above 100 h.p.; furthermore, self-regulating generators have been specified.

This is a fairly large installation and, apart from the additional cost of regulating and motor control gear, it will result in a fault MVA well in excess of the rupturing capacity of standard circuit-breakers. New types have been specially designed with a breaking current of 75 kA, equivalent to 57 MVA at 440 V. This is another added expense, and the installation will be subjected to far greater fault currents and electro-mechanical stresses simply to obtain an exceptionally low transient voltage drop. This is not being realistic.

Two questions which have become controversial are: What overload setting should be assigned for a c.m.r. motor? Should single-phase protection be given to a star-connected machine? Theoretically, a c.m.r. machine has no overload capacity; therefore the setting of overload trips should be 100% full-load. This has proved to be quite satisfactory in practice, since each individual drive is designed for a maximum demand which is rarely called upon and designers of auxiliary equipment make sure that they have a margin in hand; so, putting all theory on one side, in practice a motor is never called upon to exert full-load except under fault conditions. Even if there is an error of 10% in the overload setting, a motor with Class "B" insulation will carry such an overload without difficulty since there are so many other variables. For example, the ambient temperature may not be as high as allowed for, the motor design may be based on the maximum temperature not being reached at full load, or the machine/motor combination is such that full-load is rarely reached, etc.

Single-phase protection is always a desirable feature, even with star-connected motors, and should be of a type which does not necessarily depend on overload alone for its operation.

Emergency Service

Statutory regulations require a self-contained emergency source of power to be fitted above the bulkhead deck and outside the main machinery casings. The power available must be sufficient to supply all those services that are, in the opinion of the administration, necessary for the safety of passengers and crew in an emergency.

In general, these services include emergency lighting, emergency fire and bilge pumps, sprinkler pump and watertight door motors. Normally the capacity of the emergency generator is small and is not capable of supplying much more than the above-mentioned services. A better proposition, and one which has been carried out, is to install a machine, or machines, with a capacity sufficient to handle the terminal port load, so allowing the main generating plant to be shut down. This has proved an advantage in diesel ships and should be even more so in steam ships where it is often desirable to shut down boilers.

Economics of an A.C. Installation

Dependent upon what is specified, it is now established that the capital cost of a sound and satisfactory a.c. installation is below that of its d.c. counterpart. In so far as operating costs are concerned, the electrical staff on board can be reduced by half, a saving in salaries, accommodation, feeding and paid holidays which is quite appreciable. Repair and maintenance costs show, on an average, 75% reduction on a comparable d.c. system and, further, there is another large reduction in expendable parts for motors and control gear.

Limitations of a 440 V, 3-phase System

It has been demonstrated in practice that an a.c. system is reliable, satisfactory and economical. Future problems to be solved concern the engineering of the still larger capacity installations. It is quite possible we shall have ships in the future with a generating capacity of 12,000 kW and a steaming load of 8,000 kW. Such an installation would be beyond the capabilities of present-day standard 440 V switchgear.

A number of proposals have been put forward. These include: (1) a split main switchboard with two or more generators on either side and a spare machine on a centre section with bus couplers; (2) the inclusion of one or more reactors in the busbars; (3) the use of standard

Table 1.
Comparison of weight and cost between 220 V d.c. and 440 V a.c. 60 c/s motors for sea-going service, 1,730 r.p.m.

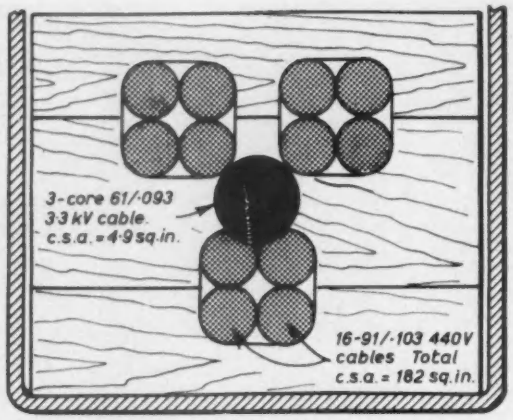
H.P.	Weight d.c. lb	Weight a.c. lb	Cost d.c.	Cost a.c.
5·0	532	178	100%	43%
20·0	896	448	100%	42%
50·0	1,680	784	100%	43%

Table 2.
Comparison of weight and cost between variable-speed 220 V d.c. and 440 V a.c. two-speed 60 c/s motors for centrifugal pump duty. 1,730/1,150 r.p.m.

H.P.	Weight d.c. lb	Weight a.c. lb	Cost d.c.	Cost a.c.
5·0/1·5	672	280	100%	61%
20·0/6·0	1,200	728	100%	71%
50·0/15·0	2,240	1,064	100%	87%

Table 3.
Comparison of weight and cost between variable-speed 220 V d.c. and 440 V a.c. two-speed 60 c/s a.c. motors for constant torque. 1,730/1,150 r.p.m.

H.P.	Weight d.c. lb	Weight a.c. lb	Cost d.c.	Cost a.c.
5·0/3·33	672	364	100%	62%
20·0/13·33	1,200	896	100%	71%
50·0/33·30	2,240	1,780	100%	87%



Comparative space taken by 3·3 kV and 440 V feeders of equivalent load-carrying capacity in shipboard cable ducts

31 MVA, 415 V switchgear backed by fuses to BS 88; and (4) the use of non-standard switchgear of adequate breaking capacity.

All of these proposals have, as their objective, the containing of the fault level to within the s/c ratings of the switchgear, but give little thought to other problems.

For a ship with a steaming load of 10,000 kVA, conventional practice would be to install four 3,750 kVA generating sets, three being capable of meeting the maximum demand, leaving the fourth set as a stand-by. Proposal No. 1 would entail the installing of five 3,000 kVA or seven 1,875 kVA sets which would mean an increase in capital cost, together with an increase in weight and space occupied. Furthermore, it would not bring the fault level within the s/c rating of standard switchgear even with a generator subtransient reactance of 14%. It would require fuse back-up protection or the use of non-standard switchgear.

Proposal No. 2 could lead to operational difficulties and, in some circumstances, there might be a significant voltage unbalance between the two sides of the switchboard.

Proposal No. 3 would be suitable up to a certain limit, but not for an installation with a generator capacity of 15,000 kVA; the cut-off current peak kA of fuse links with ratings as low as 600 A would be of the order of 70 kA.

Proposal No. 4 would require the fitting of non-standard switchgear having a breaking capacity of at least 120 MVA at 440 V. This is, as yet, non-existent and would have to be developed. The proposals ignore the high mechanical stresses which would be experienced under severe fault conditions and also the difficulties in cabling such an installation.

3·3 kV System Advantages

Regulations which permit generation and primary distribution at 3·3 kV for large installations appears to be an obvious solution. The problem, of course, is that neither Lloyd's Register, IEE, IEC or MoT will formulate any regulations until such time as a shipowner's representative has mustered sufficient moral courage to carry out an installation and experience has been obtained.

In adopting a 3·3 kV system, we have standard circuit-breakers with rupturing capacity of 150 MVA and symmetrical breaking current of 26·3 kA which would be ample for the largest installation yet envisaged. There is, therefore, no problem associated with switchgear.

If we consider the cabling, it might be as well to consider a typically large feeder circuit. A 3-phase supply

is given to a particular subswitchboard loaded to the extent of 1,900 kVA. The feeder consists of four 91/·103 cables in parallel/phase; the four cables/phase are bunched and the three phases are in trefoil formation with 3 in. spacing between phases. The cables are carried in wooden cleats and the total cross-sectional area of the run is 182 sq in. The same supply could be given at 3·3 kV by a single 3-core 61/·093 cable having a total cross-sectional area of 4·9 sq in. The space occupied and the weight of cable fitted for a 500 ft run for the two voltages are given below.

	440 V	*3·3 kV*
Space occupied	630 cu ft	17·4 cu ft
Weight of cable	161 cwt	48 cwt

In comparing the space occupied, it must be remembered that space in a modern ship is at a premium and it is of interest to record that the problem of power supply to the 800 h.p. bow propeller motor of the *Canberra* was finally solved by stepping up the generator voltage of 440 V to 3·3 kV for this service.

Space would have to be found for transformer rooms, but it is easier to set aside an inboard space for this purpose than it is to find room for heavy feeders running at least half the length of the ship. Again, the transformer capacity can be limited; in the case of the 1,900 kVA feeder quoted as an example, 1,100 kVA of power load could safely and economically be supplied at 3·3 kV, which would result in a further reduction in weight and space occupied by the cable runs.

A point to remember when ordering cable for a 3·3 kV marine installation is that the cable must be specified for an unearthed system. When the neutral is not earthed the insulation between conductor and sheath is approximately 20% thicker.

By adopting 3·3 kV generation with generators connected in parallel in the conventional manner, a much higher rated motor can be started direct-on. With 11,250 kVA of generating capacity on the bars, a double-wound squirrel-cage motor of 900 h.p. could be so started with a 7% voltage transient. With split busbars and 5,625 kVA of generating capacity connected to each side, the largest motor which could be started direct-on would be 450 h.p. for the same percentage voltage change. Motors of 900/1,000 h.p. would be required for air-conditioning compressors and it would appear to be a better long-term policy to install direct-on started squirrel-cage motor-driven units than a number of steam turbo-compressors with their individual condensers. It is also a much simpler matter to run a 3-core 37/·072 cable for power supply than a high-pressure steam pipe. Over the years a ship is in service, maintenance would be considerably less.

It may be said that, having generated at 3·3 kV, it is then necessary to transform down to 440 V for certain power and galley services, with further transformation to 240 V for lighting and single-phase power. To the person who is responsible for the safe operation of the installation, the fitting of transformers is an untold blessing. Reasons have already been given as to why an insulated system is the most suitable and it has already been stated that, with such a system, a close observation must be kept and earth faults cleared as quickly as possible in order to reduce the fire risk. Where there is more than one earth fault on a line it may mean tripping the whole main board to locate them in the case of an interconnected d.c. installation. Where transformers are fitted in an a.c. system, the installation is divided into a number of electrically isolated sections, and earth indication can be given from each section. On an earth developing the operator knows immediately which one section is earthed and steps can be taken to locate and clear without any interruption to any other. Furthermore, one could, in an extreme case, have an earth fault on every section in the ship without any two combining to create a loss of power or fire risk.

Industrial Instrument Calibration

THE accuracy and precision required in industrial electrical instrumentation was the subject of a discussion organised by the Measurement and Control section of the IEE last week and opened by Messrs P. M. Clifford and A. Felton. The openers pointed out the difference between "accuracy" and "precision." Precision relates to the sharpness with which an indication may be read and includes a factor dependent upon the constancy of the indication for a given stimulus. Accuracy is a measure of the exactness with which the indication denotes the true value of the quantity measured. Thus, precision is a necessary prerequisite to accuracy, but it does not guarantee accuracy.

Not many years ago the chief use of electrical measurement in industry was to ascertain the consumption of energy from the mains, and for this purpose an accuracy of the order of 1% was good enough. Nowadays, however, in the mass-production of components for missiles, for automatic control, for computers and similar devices a higher precision and usually a higher accuracy are needed. Thus, the voltage output of a generator may be required to be linear with speed to a precision of parts in 10^4 and the actual voltage may have to be known to an accuracy of the same order.

The electrical quantities that often have to be measured in today's factories include resistance, resistance ratio, direct current, voltage and voltage ratio; on alternating current they include power, voltage and current at power and audio frequencies, impedance, phase angle and frequency. Various accuracies are required over this range.

Calibration Chain

Measurements on the shop floor are made with instruments which have been calibrated against the works standard, which itself has been calibrated by NPL. Sometimes the chain of measurement is even longer. It is desirable that each step should be ten times as accurate as the one that follows it, but this is a counsel of perfection and, in practice, ratios of 5:1, 3:1 or even 2:1 have sometimes to be accepted.

When examining a component for conformity with a specification, there are two procedures possible. The component may be gauged by a "go, no-go" method or it may be measured. In the first case the errors of the gauge are not allowed for and the specification tolerance must be correspondingly reduced; in the second case the known errors of the measuring instrument may be taken into account, but allowance must be made for possible instability of the measuring instrument. The choice of method is basically a matter of economics.

The ultimate accuracy required at the top of the calibration chain is clearly a matter of concern. The meeting discussed whether greater accuracy is required in NPL calibrations of works standards.

Hot line working at 11 kV

AMERICAN TECHNIQUES ADAPTED TO BRITISH PRACTICE

by H. Anderson, M.I.E.E., M.B.I.M.*

WITH a view to reducing the number of outages which are at present required for repairs and maintenance of 11 kV overhead lines, particularly of spur lines in rural areas, the Hull sub-area of the Yorkshire Electricity Board started, some 12 months ago, to study the application of American "hot line" methods to British practice.

The basic method will be fairly well known; it involves erecting auxiliary crossarms, either at the side of or above the existing crossarm. The auxiliary crossarms are equipped with self-locking retaining catches into which the conductors, after unbinding, are dropped by means of special insulated sticks. The top of the pole is thus left clear of conductors for a space of at least 6 ft on either side, and the linesmen can then climb to the pole top in safety to replace insulators and crossarm. If the pole itself is to be renewed because of decay, the new pole is first erected immediately alongside and in line with the defective pole, and the auxiliary crossarms are attached to it. Working from the new pole, the live conductors are unbound from the old pole and transferred to the auxiliary crossarms. The crossarm is removed from the old pole and equipped with new insulators provided with stirrups and with binders coiled on bobbin; it is then erected on the new pole. The conductors are now returned and bound in on the new pole and the old pole recovered. For the sake of clarity only one pole is shown in the illustrations.

* Mr Anderson is sub-area engineer, No. 6 (Hull) Sub-area, Yorkshire EB.

British Practice

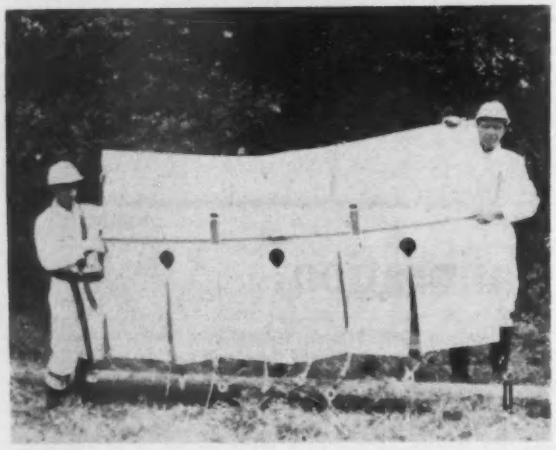
The difficulties encountered in applying these methods to British practice resolve themselves into:

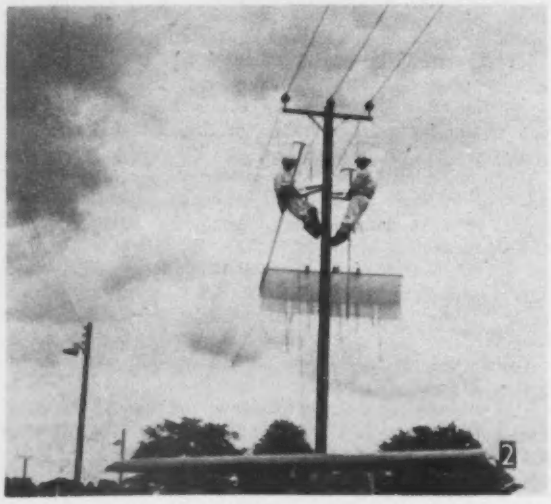
(a) The ability to unpick existing conductor binders which are not provided with any special end-loop.

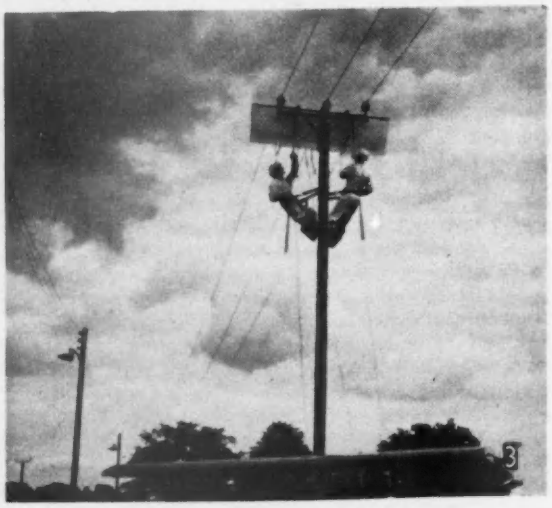
(b) The general use in this country of steel crossarms.

(c) The probability of variable weather conditions interfering with the operations.

Experience has now shown that these difficulties are not insuperable; there are many sufficiently dry days in the British spring, summer and autumn when this work can be confidently undertaken. Even when the weather







Figs. 1 to 3. 1, wood support and polythene sheet insulation for steel crossarm of BS 1320 construction; 2, insulating unit being hoisted to top of pole with nylon sash lines; 3, attaching the insulating unit to steel crossarm and turning the polythene sheet over the crossarm

becomes unexpectedly changeable, it has been found that the live conductors can safely be left on the auxiliary crossarms until weather conditions permit the work to be resumed.

A kit of special "hot line" tools was obtained from American suppliers and a team of four linesmen was selected for training and to undertake the experimental work; practice was carried out on dead lines and on an experimental line, which was energised at 11 kV through 1-megohm resistors.

Initial work with the equipment was aimed at unpicking normal BS 1320 binders with a 7 ft 6 in. "hot line" stick having a special adaptor with a V-shaped notch at the head; the linesman practised in the workshop for many odd half-hours before attempting unbinding on dead equipment at the top of the pole. It soon became evident that the existing type of binders could readily be unpicked with this type of tool, after some practice.

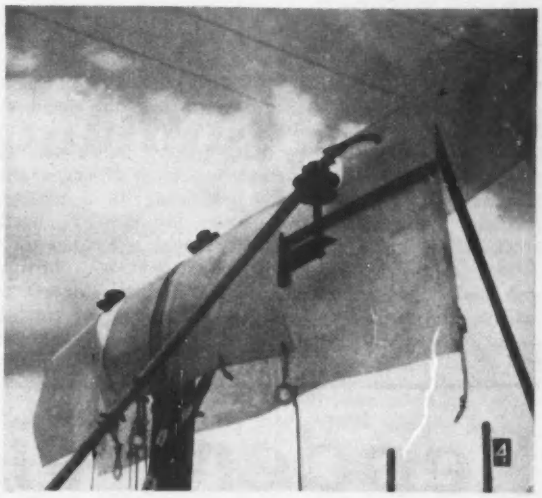
The next approach was to determine whether, when carrying out the operations of unbinding and rebinding conductors on pin insulators, the danger of energising the insulator pin and/or the supporting steelwork could be avoided. Practice drills showed that whilst many such operations could be performed without any contact taking place, this could not be guaranteed, so that the possibility of danger to the linesman from this source might arise. It had to be accepted that, unless some special guarding was provided, the unbinding and binding of the conductors on pin insulators might result in momentarily energising the insulator pin, the crossarm or the top of the wood pole itself.

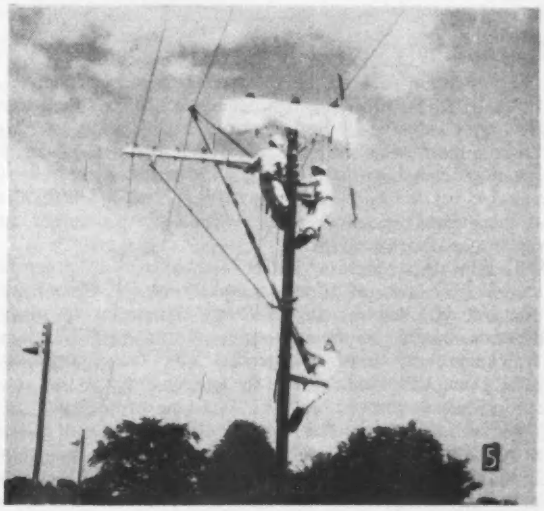
Investigations were therefore made of the voltage distribution down the pole should it become energised. It was found that for poles that were dry and not in a newly creosoted condition, the resulting leakage current was very small indeed, and thus was not likely to be a hazard should a linesman shunt a portion of the pole with his body. On the other hand, it was found that freshly creosoted poles and poles in a wet condition would conduct a current which might be dangerous to a linesman should his body shunt several feet of a pole.

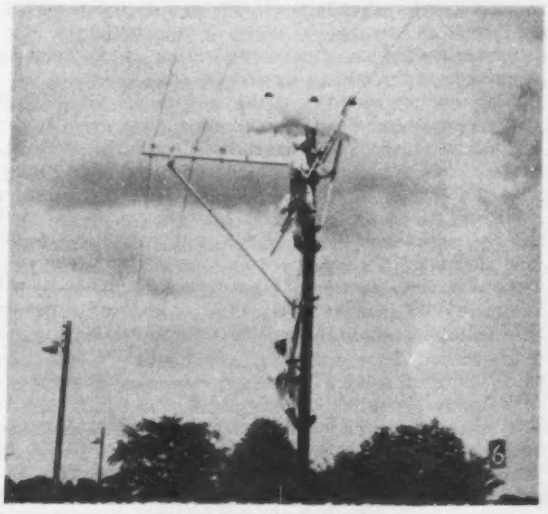
The linesmen work in rubber boots and wear industrial-type gloves but, as a result of the tests, it was considered prudent to provide some form of insulating guard to prevent chance contacts during the unbinding and rebinding operation.

Insulating Guard

In order to provide an insulating guard which could be used not only on the newer lines to BS 1320 but also on older types of line which use a wide variety of pole-top steelwork and insulators, it is obviously necessary to have something which is flexible and capable of easy modification to suit the different types of construction, bearing in mind that this equipment has to be fitted on the pole top from a distance of 4 ft or more from the live conductors by means of insulating sticks. The conclusion was reached that insulation by means of flexible sheets, such as rubber, offered the best solution. Rubber sheeting having the required insulation value was found to be too heavy, but progress has been made to the present stage where equipment has been produced to fit the standard BS 1320 steel crossarms (Fig. 1); this comprises a framework supporting a single sheet of polythene $\frac{1}{16}$ in. thick, which can be hoisted to the pole top as one unit and readily mounted, using the insulated sticks and held in position with stretched elastic cords (Figs. 2 and 3). The insulating sheet folds round the lower shed of the insulators and also covers the pole top and steel struts







Figs. 4 to 6. 4, use of "ice axe" adaptor end to manoeuvre polythene sheet into position (the demonstration pole shown has no conductors on the insulators); 5, insulating unit in position; second conductor unbound and being transferred to auxiliary crossarm; 6, third conductor being unbound with insulation in position

(Fig. 4). The result is that whilst the work is in progress the insulating guard is not in contact with the live conductors but only the lower sheds of the insulators, and unbinding and binding of the conductors can take place without fear of chance contacts with the steelwork (Figs. 5 and 6).

The design of insulating frame is such that it can be readily made up to fit different lengths of crossarm and insulator pin; development is proceeding on a separate box-type insulating unit to cover the steel extension brackets used on the older lines with triangular formation.

New insulators are fitted before erection, with stirrups and binders, the latter being coiled on either side of the insulator on bobbins which unwind as they are thrown round the conductor by means of the notched tool at the end of the insulated stick.

The application of these methods is at present restricted to work on 11 kV intermediate poles only, and no attempt is being made at this stage to extend it to the more complicated operations involved in working on section and angle poles. Even with this limitation, however, the use of these special methods is found to be well worth while, and a number of decayed poles have been changed without interrupting supplies in a large rural area. In a recent demonstration, an intermediate pole on an 11 kV BS 1320 line supplying a large farm load was changed in a total working time of 3½ hr.

The development work on this project has been carried out by Mr G. W. Burnett, sub-area rural development engineer, and thanks are due to the chief engineer of the Yorkshire Electricity Board and the manager of No. 6 (Hull) Sub-Area for permission to publish this information.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Responsibility for Earthing

IN the ELECTRICAL TIMES of 16 November, 1961, Sir Robertson King is reported as having stated that the supply industry should accept responsibility for earthing What is the implication? There are four methods of earthing already in use: (a) direct or solid earthing; (b) earth-leakage; (c) multiple neutral earthing; and (d) fifth-wire earthing used in rural areas. Which system might an earthing authority adopt?

The most popular or widely used system in domestic premises is that of direct earthing. Many factors are involved, but the isolation of faulty equipment on wiring depends finally on fuse-blowing. Wrong fuse selection, after searching tests are carried out, may completely nullify its adequacy. How can anyone, except the consumer, accept responsibility for this type of earthing?

Earth-leakage circuit-breakers will eliminate the risk attached to indiscriminate fusing, and higher values of loop impedance can be accepted, but who will bear the responsibility of installation? The supply industry or the contractor, who already feels that the electricity boards do too much installation work? If one authority must accept responsibility, then earth-leakage circuit-breakers might replace the present service cut-out.

With multiple earthing of the neutral, all installations on the system must be in good condition, else new dangers may be introduced. If this method is to be generally adopted, then the responsibility of inspection might change from the NIC to the supply industry. Fifth-wire earthing eliminates the variable in direct earthing caused by earth electrode resistance areas, but is still subject to faulty fuse selection.

An extensive survey of the foregoing methods will surely indicate that no one person, or authority, can be responsible for absolute earthing protection.

R. Dalziel,
GLASGOW.

* * *

IF area boards are to be forced to take further responsibility in providing a safe earth, as Sir Robertson King is reported to have suggested, then they will have some difficult technical problems to solve. At present, the question of whether earthing arrangements are satisfactory is resolved by the IEE Regulations into a choice between obtaining a sufficiently low-impedance earth-fault-current path, and fitting of an earth-leakage circuit-breaker. But although the e.l.c.b. satisfies the IEE requirements, if the NICEIC statistics are to be accepted at face value it does not give really effective long-term protection.

Does this mean that the boards should think in terms of providing more extensive protective multiple earthing in areas where direct earthing is difficult? Or is there hope that the e.l.c.b. in some improved form still at reasonable cost will be evolved to meet current criticisms?

If Government intervention is indeed a risk at present, it is to be hoped that the authorities are ready to give guidance on this point, for installation-planning is affected.

Planner,
LONDON.

Electromagnetic Metal Forming

HEAVY current discharges from capacitors are used to set up impulsive magnetic fields in the "Magneform," a machine for metal-forming brought into production by the General Atomics Division of the US General Dynamics Corporation. Magneform employs a magnetic field applied in pulses of 10 microsec to 20 microsec duration, to give pressures of over 50,000 lb/sq in.

Magnetic fields of up to 300 kG are produced in the forming operation, which has developed from work on high current discharges carried out in thermo-nuclear research. Metal placed in the high intensity field is repelled away from the coil generating the field because of induced current effects. It is the force of repulsion that is used for forming the metal.

An advantage from the production viewpoint is that it is not necessary to bring the workpiece into physical contact with the coil producing the field. Thus, marking of the workpiece is obviated.

One application of the Magneform is assembly of groups of separate components into a finished product tightly enclosed in metal containing bands. Many different shapes can be assembled together, because the magnetic field can apply pressure to complex contours, wrapping the containing band of copper or aluminium tightly into all indentations and over all protrusions.

An example of applications of the machine is assembly of a small electric motor. The electromagnetic pulse acts on a metal band containing the various components, compresses them radially and axially, and then folds over the ends of the containing band to give a tight fit.

Calculating stability

I.E.E. PAPERS PRESENT ANALOGUE TECHNIQUES

MUCH attention has been given in recent years to techniques of calculating the stability of multi-machine power systems. Two papers* presented last week at a meeting of the IEE Supply Section record some recent advances.

The paper on the analogue computer notes that the principal disadvantage of the direct analogue approach is the inadequate representation of synchronous machines. Of the various attempts that have been made to improve this feature, Dr Aldred considers the most promising to be the use of d.c. electronic analogue computers. However, there are formidable difficulties about coupling such analogues to conventional a.c. network analysers unless a number of approximations are made. This has prompted the investigation of ways of using a d.c. electronic analogue computer for simulating a complete power system network.

The paper builds up the idea of such a computer from the philosophy that it is possible to recognise an equivalent electronic analogue interconnection for each component of a power system network, whether it be machine, transformer, transmission line or load. By piecing together the individual interconnections, the complete system is simulated, provided only that the necessary transformations between the different alternator-rotor reference axes are first established.

The paper is concerned with showing how a basic type of reference frame can be appropriate to the analysis of each component of a system. All machines in the system must be referred to the one reference frame.

If a power system is simulated in the way described, it is claimed that the inclusion of additional devices such as voltage, torque, angle or speed regulators, may be simulated relatively simply. Furthermore, by using techniques identical with those employed for simulating synchronous machines, electronic analogue circuits may be established for dynamic loads. In this way, such problems as the effect of large induction motor loads may be studied.

The advantages claimed for the electronic analogue computer are summed up by the author as follows:

(a) D.C. operation throughout, resulting from the use of Park's reference frame for all components of the system.

(b) Flexibility in changing system parameters and versatility in simulating additional elements.

(c) High-speed and repetitive operation.

(d) Accuracy.

(e) The controls on the analogue are identical with those on the system.

(f) A general-purpose machine is used which may be employed for problems other than power-system networks.

* Paper No. 3694: "Electronic Analogue Computer Simulation of Multi-machine Power-system Networks," by A. S. Aldred, M.SC., PH.D., A.M.I.E.E. Paper No. 3715: "Analysis of Overall Stability of Multi-machine Power Systems," by J. G. Miles, B.SC.(ENG.), A.M.I.E.E. (Liverpool University and AEI, respectively).

Effect of Approximations

The paper by Mr Miles notes that for reasons of analytical convenience it is usual to carry out separate studies of transient and steady-state stability. It is assumed that the system has overall stability if both checks are satisfactory.

Methods of analysis normally used for such studies provide a valid basis for the design of systems where some degree of uncertainty about the actual stability margins can be tolerated. But assumptions made assume greater importance when systems are to operate.

The assumptions normally made are as follows:

(a) Transient Stability. (i) No transient saliency. (ii) Constant flux linkages. (iii) No damping torques. (iv) Constant mechanical input torques. (v) Stability determined by the first swing of the machines, including those with the longest period.

(b) Steady-state Stability. (i) No synchronous saliency. (ii) Constant field current. (iii) No inertia effects.

The paper is concerned with developing a general system of equations for the transient behaviour of a multi-machine system and with using these equations to check the magnitude of errors introduced by the above assumptions.

In course of discussing the development of equations for multi-machine systems, Mr Miles comments during the reduction of power system for such purposes, some combining of generating units may be necessary, resulting in a suitable number of "equivalent machines." Just what is a suitable number is governed by the scope of the computing facilities available. For the largest currently available computers, either digital or analogue, a convenient upper limit has been found to be five machines, of which four are fully responsible and one is an infinite source, i.e., a point of maintained voltage and angle.

The generalised system equations presented in the paper consist of 23 equations, of which eight are sets of simultaneous equations, one for each machine involved. A start is made with values of rotor angle, field flux linkage, field voltage and mechanical power input for each machine.

An electronic differential analyser type of computer was used in the studies described in the paper.

The paper includes results of a stability study of a representative transmission system. This had 13 generators, which were grouped into "equivalent machines" including one, one, eight and two machines, with the remaining machine the reference machine ("infinite source"). Three of the machines represented predominantly round-rotor machines, the other (the two-machine group) salient-pole machines.

The fault considered was a three-phase short-circuit near the h.v. busbar of a generator, cleared in 0·1 sec by opening the faulty circuit at each end.

The author concludes that introduction of transient saliency does not substantially affect the form of the swing curve. Representation of transient saliency, damping and flux decay together gives a result which is slightly less

stable on the first swing than that obtained by allowing for transient saliency alone. It is found that presence of a voltage regulator on the machine nearest the fault has a noticeable effect on machine stability during first angular swing, and the presence of the governor on the machine has a smaller but perceptible effect on the stability following the swing. Presence of voltage regulators and governors on other machines in the system has negligible effect on the overall stability.

The effect of a sustained load change on the network was also studied, by simulating a step increase in the mechanical power input to machine 1. For each case considered, the amplitude of the step was varied until a limiting value was reached at which synchronism was lost. From the results obtained, it is concluded that the stability limit given by conventional methods lies about midway between the value obtained by full representation of the machines without regulator or governor effects, and that obtained by including the latter.

When the full equations given in the paper are applied to a power system, the difference between transient and steady-state stability becomes of less significance. The factor of importance is whether, after a given disturbance, the system will ultimately regain synchronism and maintain it without sustained oscillation.

Overall, transient stability studies with normal network analyser assumptions are considered to give a substantially correct result for systems composed predominantly of round-rotor machines equipped with excitation systems of moderate response.

DISCUSSION

PROF M. W. HUMPHREY DAVIES (Queen Mary College, UL) said that Dr Aldred's paper described a method of analysis which was relatively economic as analogue methods went. A particularly good feature was simulation of governor effect. In both papers, the difficult problem of representing the relative mechanical displacements of more than two machines was overcome by the use of servo resolvers. He felt that this might lead to hunting if a relatively large number of machines were involved.

The conclusions drawn by Mr Miles about the effects of assumptions in "conventional" network analysis were not justified by the paper alone; but they were backed by wider experience, and Prof Humphrey Davies agreed with them.

His own view was that it would be only a few more years before techniques were available for carrying out analyses of the type described more conveniently on digital computers than on analogue machines. However, present computers often had not the necessary storage capacity, suitable programmes had not been developed, and the philosophy of planning to get good output was still in the early stages of development.

DR G. SHACKSHAFT (CEGB) said it was dangerous to assume that a more complex set of equations would give better results. This had been illustrated by the Cliff Quay tests some years ago. He thought accuracy could be improved by taking into account two effects ignored in the papers: braking torques and the variation of damping torques. He commented that there was considerable difficulty in defining what was steady-state stability, what was dynamic stability, and what was transient stability.

MR G. LYON (Merz and McLellan) commented that both the authors seemed to be relying on analogue-type machines, whereas a few years ago it was thought that a combination of digital and analogue would be best. He did not like the network reduction processes which were involved. Without them, however, about 500 amplifiers would be needed for a ten-machine network study. He found it reassuring that the study by Mr Miles showed that conventional techniques gave results that could be relied on for the general run-of-the-mill planning work.

DR B. ADKINS (Imperial College, UL) spoke of the increasing use of control system theory in system analysis. He thought engineers should start to talk about electro-mechanical system theory rather than about control system of power system theory. Like other speakers, he was unhappy about the definitions of various types of stability. A power system was never really in a steady state. He suggested that steady-state stability should be regarded as something tested by a small disturbance, transient stability as something tested by a large disturbance.

MR K. C. PARTON (GEC) said he thought it a mistake to use analogue methods for the kind of job described in the papers, because the quantity of equipment required was so large. He welcomed the confirmation in Mr Miles' paper, that the assumptions made in conventional studies did not involve important errors. He thought the grouping of machines in the method described by Mr Miles was dangerous. Also, in some studies, it was difficult to find a point to make an infinite busbar. He went on to say that it had become apparent that clearance of faults on systems was not as fast as engineers would like them to be.

MR H. A. CALDERBANK mentioned the use of function generators in an analyser. He also pointed out the difficulties involved in dealing with systems having extensive tap changing.

DR P. AYLETT (Ferranti) thought the papers rather dangerous. They were so well done and ingenious that they could lead engineers astray. Park's equations, on which the analysis in the papers was based, left out some of the most important factors in system stability calculations. If a method of analysis gave plenty of safety margin, it was probably uneconomic in an engineering sense. It would be grossly uneconomic to have a system that could withstand a three-phase fault for any length of time. The trend today was to design closely to acceptable limits. So far as analysers were concerned, the present was an unsatisfactory half-way house. He was quite sure that transient stability problems would be tackled on computers in the future, because these were getting faster every year.

MR E. B. POWELL (CEGB) described work that had been carried out by putting faults on generators. High rate-of-response regulators showed increased synchronous stability. He was not so happy about the effect of governors. They tended to get out of step, so that the valve opened when the machine speed was rising. Curves were available that would relate relay operating times to the probability or otherwise of retaining stability under fault conditions.

DR P. P. GUPTA (Queen Mary College, UL) said that analogue computers imposed a limit on the size of system that could be analysed. Digital computers, although expensive in first cost, were becoming available through time sharing and data transmission links.

MR S. RUDZINSKY (CEGB) thought that in steady-state stability studies it was not practicable to reduce the system to one or two machines.

MR K. M. JONES (AEI) argued that the method of analysis suggested by Mr Miles had to be looked at as being one way of doing a certain job with the tools that were ready to hand. The quickest method had over the years become the "conventional" method; but always extra studies had been made when stability margins were thin.

In his reply to the discussion, DR ALDRED made two general points. On the question of analogue versus digital computers, he said that in the present state of the art he thought the analogue computer superior, but that would be a short-lived condition. His second general point was that engineers needed to get away from using too many assumptions and approximations.

MR MILES, in his reply, said that one of the reasons for the study presented in his paper was to check the validity of assumptions commonly made; another was to show the system as a servo-mechanism. If the first swing after a fault was negotiated, the system was at the mercy of the controls. He suggested as a time scale for an analogue study: about two weeks to draw out the circuit, a day to wire it up, four days to eliminate wiring errors and a few minutes for each swing curve set.

NOTES ON WIRING

BY MEGOHM

MY previous remarks concerning the zinc plating of outlet boxes has raised a few queries in the trade. When I mentioned boxes, I had in mind those made from steel and used in flush situations, and I would be interested to hear how zinc-plated boxes compare with enamelled boxes from a resistance to corrosion aspect. We all know that there are many grades of plaster and cement in general use today, and I feel that these must have a varying effect on all metals. I believe that in America steel boxes were used a long time before it was the practice to do so in this country. In fact, I now understand that in America the zinc plating of steel boxes is laid down in their specification. I have never been able to obtain any samples of American electrical accessories really to study them.

If zinc plating is definitely proved to have a higher resistance to corrosion than an enamelled finish, then there is something to be said in its favour. The enamel on standard boxes has to be cleaned off to ensure a good earth continuity and this often leads to corrosion. If these boxes were zinc coated, would this cleaning away be eliminated? I see no reason why not, providing the zinc plating remained perfect and provided lasting continuity.

The Common Market

We are now hearing about the European Common Market every day. So far there have been few signs of reaction in the electrical industry regarding our possible entry into this association. I am a little amazed at the apparent apathy of our accessories manufacturers on this matter. These manufacturers, as far as I can see, spend thousands of pounds making tools which eventually produce accessories which market at a few shillings and are all in a very competitive business. The present-day trend of building calls for a good, competitive-priced article. What happens, then, when Continental goods start flowing into this country?

The British Standards for accessories, particularly plugs and socket-outlets, are completely different to those on the Continent, and surely this in itself must be a problem to our manufacturers. Presumably, *if* we become a member nation of the Common Market, the ultimate aim must be some form of standardisation and interchangeability of products amongst participants. If this is so, then which standard will be adopted? Ours or the Continental one? Whichever is adopted, the manufacturers of the other standard face a vast change indeed, and it is my belief that *we* shall be the people to change.

The majority of Continental plugs and socket-outlets seem to be of the two-pin type. Earthing is resorted to only in certain specified positions. The plugs are, in the main, designed with the flexible entry at the top as opposed to our normal side entry. These plugs are also provided with a substantial guard against touching the plug pins when inserting or removing the plug.

Continental switches and socket-outlets are designed so that the interior has to be fixed first before it is wired. After fixing, the cables are connected to "top" terminals and, finally, the cover is added. This is different to our method of connecting the cables into the back of the accessory and then pushing the unit into position. I know of only one British socket (of modern design) which allows the body to be fixed then connected.

I must point out that, from investigations, where a socket with an "earth" is used on the Continent, it is not possible to insert a non-earthed type plug into it although all plugs and sockets are two-pin type. The earth is obtained by what we call a scraping earth. Incidentally, it is generally permissible on the Continent to install a socket in the bathroom provided it is 7 ft from the floor and "out of reach of the bath."

Plating on Accessories

Still on the subject of the Common Market, there is another difference between British and Continental accessories. British manufacturers, in the main, supply their plugs, switches, etc., with all the brass and non-ferrous components such as plug pins, terminals, etc., beautifully cleaned and gleaming. These, of course, soon tend to turn a darker colour and some of them even go green. Continental manufacturers electro-plate the non-ferrous components. Plug pins, terminals and contacts are plated with nickel, tin, zinc, etc.

If there is the same competition amongst Continental manufacturers that there is in this country, I hesitate to think that all this is done for appearances' sake. Have these firms some special technique which allows them to plate cheaply and quickly or have they adopted this to counteract corrosion? Would, therefore, such plating be insisted upon if the British manufacturer enters the continental market?

Also, how would our other "standards" stand up to continental requirements and competitive selling? One side must bend farther than the other and, if this side turns out to be us, then there might well be a major shake-up all around. We have, up to the present, been too interested in what effect the Common Market will have on cars, or even on which side of the road we might drive on. Let *us* now start to look around and see how it will affect our industry. Even the matter of the "standard voltage" might be raised and this, I think, would cause no end of fun and games. We have not yet achieved full voltage standardisation in *this* country and manufacturers already know the effects of this. Yes, indeed, let us sit back and weigh up these matters and tackle them before they tackle us.

I would like to add that I have been quite unable to inspect *all* the makes of switches, etc., involved in this matter and it may well be that some do not fit my descriptions, but I feel that my general remarks do apply to this rather important issue.

Building Exhibition

Readers may wonder why I have said nothing about the important Building Exhibition which has just finished. Up to the time of writing these notes I have not had the time to visit it. Before my next appearance in these columns, I hope to have rectified this situation and to have found something of interest.

Personalities *in the industry*

Mr D. W. V. Parkes

Mr E. L. N. Towle

Mr C. G. Smith

Mr R. H. Phillips

Mr D. L. Tabraham

Sales promotion manager to Tricity Cookers Ltd. since early 1960, **Mr Derek W. V. Parkes** has been appointed a director of the company. After taking a degree of Bachelor of Commerce at Bristol University, he was with the South Western Electricity Board for five years before joining Tricity Cookers Ltd. in 1955. He subsequently held the positions of southern area manager and southern sales manager until becoming sales promotion manager last year.

Mr K. L. Murray has been appointed engineer and manager of the Electricity Supply Department of the State Electricity Commission of Victoria, Australia. He will succeed **Mr K. Sutherland** who retires on 9 Dec. after holding that position for the past 12 years. Mr Murray will be responsible for electricity distribution throughout most of Victoria, and for extending the Commission's supply network. He joined the Commission in 1924 and has occupied many managerial posts in the Electricity Supply Department. In 1959 he was appointed assistant engineer and manager, and spent six months overseas studying the latest developments in electricity supply. He has also been chairman of the Commission's work and methods study organisation since its formation in 1957.

Director and general manager of Chloride Batteries Ltd., **Mr C. G. F. Pritchett** has been elected chairman of the Accumulator Makers' Association.

Mr E. L. N. Towle, B.SC.(ENG.), M.I.MECH.E., M.I.E.E., M.I.MAR.E., has been promoted to manager, Industrial Applications Engineering Department, Rugby and Manchester, AEI Motor and Control Gear Division. He succeeds **Mr B. Pringle,** M.B.E., whose retirement we reported last week. He has been assistant manager, Industrial Applications Engineering (Manchester) since the formation of the AEI Motor and Control Gear Division, after being assistant chief engineer (industrial), Electrical General Engineering Department, from January, 1953. Mr Towle joined Metropolitan-Vickers as a college apprentice in 1921 and became assistant textile engineer in the Motor Dept. in 1924. After three years as assistant works manager of a firm of lift manufacturers he returned to Metrovick in 1929, joining the Industrial Section of General Engineering Dept., where he was responsible for general electrification schemes. In 1945 he became engineer-in-charge, marine, being responsible for the design and co-ordination of diesel-electric propulsion schemes and marine auxiliaries.

Mr A. E. Grimsdale, commercial director of AEI (Manchester), has joined the board of Nuclear Graphite Ltd. in place of **Mr G. S. C. Lucas,** director of engineering of AEI (Rugby) Ltd. **Mr E. Tankard** has been appointed as part-time director (finance). He is comptroller of the AEI-John Thompson Nuclear Energy Co.

E. K. Cole Ltd. announce the appointment of **Mr C. G. Smith** as distribution manager for the Ekco group of companies. He will control the storage and transport facilities of the finished products of E. K. Cole Ltd., including Ekco, Ferranti and Dynatron radio and TV; Ekco heating, plastics and electronics products. Previously office organisation controller at the Southend works. Mr Smith has been with the company since 1934.

As from 1 Jan. next **Mr N. R. Wheldon** becomes northern area manager for Scotland and the areas at present covered by the Leeds and Newcastle upon Tyne offices of the Electric Construction Co. Ltd. He will be based at Leeds. **Mr D. Crotch,** who has assisted Mr Wheldon at the Glasgow office for the past three years, is appointed manager of that office. Mr Wheldon served his apprenticeship with the Brush Electrical Engineering Co. Ltd., after which he spent eight years with the Lancashire Dynamo group, finally as sales manager, Crypton Equipment Ltd., and he was then with G. P. Dennis and Co. for 3½ years before joining the Electric Construction Co. in Glasgow in 1956.

Previously with Eddystone Radio, **Mr H. Morrison** has joined Hadley Telephone and Sound Systems Ltd. as production manager.

Previously with Thorn Electrical Industries Ltd., **Mr H. D. Garland** has joined Magnavox Electronics Ltd. as chief engineer, with responsibility also for design. At one time he was chief radio and audio engineer with Philco (Overseas) Ltd., but when that concern was absorbed by Thorn's he subsequently became export radio engineer to the group.

In the newly formed company, GEC (Lighting and Equipment) Ltd., to which we refer on page 823, the chairman and managing director is **Mr J. O. Sewell,** who joined the company in September from the Yale and Towne Manufacturing Co. Other directors of the company are: **Mr R. H. Phillips,** T.D., ASSOCIATE I.E.E. (commercial director), **Mr D. L. Tabraham,** M.A., F.I.E.S. (development director), **Mr G. Beebee** (director and secretary), and **Mr K. R. Bond,** who also serves on the board of GEC (Home Products) Ltd. Other management responsibilities within the new company are: **Mr W. G. Williams** (sales), **Mr S. A. Ritchie** (finance), **Mr E. H. Davidson** (production), **Mr H. Allen** (personnel), and **Mr Ivor Williams,** M.B.E., T.D. (exports). With the new appointments, Mr Phillips and Mr Tabraham relinquish their responsibilities as managing directors of the Installation Equipment Group and the Lighting and Heating Group, respectively. Mr Phillips started with GEC in 1926 at Witton and transferred to the sales side two years later. He became manager

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**Denotes revision to the "Electricity Supply Handbook, 1961."*

of the Installations Materials Department at Birmingham in 1939, and after war service was manager of the Leicester branch until 1949, when he became assistant manager of the Midlands area. He was appointed area manager in 1957 and in January, 1960, was appointed managing director of the Installation Equipment Group. At the same time, Mr Tabraham became managing director of the Lighting and Heating Group. Earlier he had been manager of the Lighting Division from 1957, after being manager of the Lighting Fittings Department for six years. He started with GEC in the Research Laboratories as a trainee in the illuminating engineering section.

Mr R. G. Tolley has been elected to the board of Simms Motor Units Ltd. He joined the Simms group in March, 1960, and subsequently became general manager of the Electrical Division at the new Ponders End factory.

Mr F. H. Starks has been appointed technical representative for the Martindale Electric Co. Ltd. in the London area.

Mr N. E. Rundle, B.SC.(ENG.), has been appointed project engineer to Plannair Ltd. A son of Mr E. W. Rundle, managing director of the company, he was previously for nearly five years with Vickers Armstrongs (Aircraft) Ltd.

Dr M. F. Kaplan, of Pretoria, South Africa, has been appointed research director of the Civil Engineering Research Council in London. He will be taking up his appointment in February. He is at present head of the civil engineering division of the Council for Scientific and Industrial Research in South Africa. The Civil Engineering Research Council was established earlier this year by the Institution of Civil Engineers, the Federation of Civil Engineering Contractors and the Association of Consulting Engineers.

Mr N. G. Leaf has been appointed to the board of Atlas Lighting Ltd., and will continue to be responsible for overseas marketing of Atlas Lighting products. He will also manage the International Division of the parent company, Thorn Electrical Industries Ltd., which has been established to co-ordinate the export operations of the group, covering, in addition to lighting, Ferguson radio and TV receivers, Tricity domestic appliances, Brimar valves and c.r.t.'s and Thorn electronic components. Mr Leaf has been with the company since 1931 and joined the Export Division in 1953.

Mr N. G. Leaf

Mr P. Sydney

Manager of the Lyndhurst district of the Southern Electricity Board since September, 1953, **Mr M. Clissold** is to retire on 20 Dec. after over 40 years' service in the electricity supply industry. His successor in that position is to be **Mr A. W. J. Hunt,** who has been senior assistant commercial engineer (sales and contracting) on the Bournemouth sub-area staff. The latter post is being taken over from 1 Dec. by **Mr R. P. Coombes,** ASSOCIATE I.E.E., who has been district commercial engineer at Southampton since October, 1958 (*ESH, page 98). Mr Clissold received training with Edwards and Armstrong Ltd., electrical engineers, of Stroud, and became branch manager at Melksham with the Western Electricity Supply Co. In 1930 he moved to Salisbury with the Wessex Electricity Co. as assistant district manager, and became manager of the Salisbury rural district in 1946. He was district manager at Yeovil from 1949 to 1953. Mr Hunt started as an electrician apprentice with the former Bournemouth and Poole Electricity Supply Co. and subsequently served in their showrooms. He became an installation assistant in 1936 and in the following year joined the Wessex Electricity Co. at Melksham as a commercial supervisor. After five years' war service with the Royal Navy, reaching the rank of Lieutenant-Commander, he went to Salisbury in June, 1946, as a commercial supervisor. Mr Coombes also started with the old Bournemouth company, as a technical representative, and was deputy district consumers' engineer at Parkstone for some months until Sept., 1946, when he became district consumers' engineer at Wareham. He subsequently served as installation engineer in the Bournemouth district and from Sept., 1957, was assistant district commercial engineer.

The new chief commercial officer of the Eastern Electricity Board is to be **Mr Percy Sydney,** who has been manager of the Board's Chilterns sub-area since early in 1960. He succeeds **Mr R. H. M. Barkham,** B.SC.(ENG.), M.I.E.E., who has been appointed deputy chairman of the Yorkshire Electricity Board (*ESH, pages 105/6). Born in London and educated at Tonbridge School, Mr Sydney served with the former Wessex Electricity Co., and in 1941 became general manager of the Cambridge Electric Supply Co. He remained there until nationalisation, when he became commercial officer of the Fens sub-area of the Eastern Electricity Board. He was manager of the Suffolk sub-area from 1952 to 1960, and during that time was responsible for the considerable electrification undertaken in the area, which is largely agricultural.

Queen Elizabeth the Queen Mother, in her capacity as Chancellor of London University, greeting Lord Nelson of Stafford, chairman, English Electric Co., last Thursday, when she conferred on him the honorary degree of D.Sc.(Engineering)

Mr J. Samuels, for six years a member of the board, has been appointed managing director of Winston Electronics Ltd. **Mr W. Allan Bridges** continues as chairman of the board, but relinquishes the position of managing director. Mr Samuels joined Winston Electronics in its early days after several years with Standard Telephones and Cables Ltd., and Sunvic Controls Ltd. In 1956 he was appointed purchasing director, then works director in charge of production and two years ago sales director in charge of manufacturing sub-contracts.

Mr A. J. Ellis, general works manager, **Mr J. Capeling,** works manager, Fluorescent Fittings Division, and **Mr T. P. Metcalfe,** financial controller, have been appointed to the board of Smart and Brown (Engineers) Ltd.

Sir William Lamond has been appointed chairman of the Calcutta Electric Supply Corporation Ltd. in succession to the late Sir Harry Burn. **Mr I. A. Macpherson,** a director, has been appointed deputy chairman, and **Sir Owain Jenkins** and **Mr A. R. Colley** have become directors.

Electric and Musical Industries Ltd. have appointed the following as divisional directors of the company: **Mr P. A. Allaway, Mr E. G. Hurst, Mr W. Roxburgh, Mr J. G. Stanford, Mr N. E. Tomlinson** and **Mr L. G. Wood.**

Mr G. Clarke, A.T.I., of the Electrical and Insulating Division of Jones, Stroud and Co., has been appointed an addi-

tional executive director of the company with which he has served for over 30 years.

At present sub-area accountant of the East Sussex and South West Kent sub-area of the South Eastern Electricity Board, **Mr F. W. Shaw,** A.I.M.T.A., has been appointed deputy chief accountant to the Board to succeed **Mr F. Hardman,** A.I.M.T.A., who retires next March (*ESH, pages 86, 90). Mr Shaw, who is 54 years of age, was educated at Brighton and received early training in the Borough Treasurer's Department at Brighton, in which he held a number of positions from 1927 to 1948, being first assistant accountant from January, 1946. He was appointed sub-area accountant of Seeboard's Mid-Sussex sub-area in April, 1948, and in June, 1957, following the Board's decision to integrate the accounting organisations of East Sussex and South West Kent and Mid-Sussex sub-areas, he took up his present position.

Works director of George Forrest and Sons Ltd. since 1950, **Mr G. Gibson** has been appointed to the board of Nash and Thompson Ltd., another Thorn subsidiary. He assumes responsibility for co-ordinating production matters and for the integration of Nash and Thompson activities with those of the group.

Production controller of J. G. Statter and Co. Ltd., **Mr A. Marshall** has been appointed to the new post of field sales manager. He has been with the company for four years, and a large part of his career has been spent in Ceylon selling and installing distribution gear.

Mr I. G. Ellis, M.B.E., LL.B., F.C.C.S., A.M.B.I.M., M.I.P.M., has been appointed deputy chief personnel officer, and **Mr J. F. G. Bland,** B.A.(ECON.), A.M.I.P.M., as education and training officer of the Central Electricity Generating Board. The work of the Personnel Department has now been reorganised so that the deputy chief personnel officer will be responsible to the chief personnel officer for the whole range of activities within the department, including education and training. Mr Ellis was a district organisation officer with NALGO before joining the electricity supply industry in 1951 as a principal assistant with the South Wales Electricity Board. In 1955 he transferred to the CEA in London as an administrative officer, becoming personnel officer with the CEGB in 1958, with subsequent promotion to assistant chief personnel officer. Mr Bland entered the industry in 1950 as a senior assistant (training) with the Southern Division, at Portsmouth. He moved to London in 1955 to become the headquarters education, training and welfare officer with the CEA. On the formation of the CEGB he was with the Education and Training Branch of the Personnel Department where subsequently he was appointed assistant education and training officer (policy).

Chief engineer in charge of all domestic TV and radio activities of the Thorn group since last January, **Mr R. E. Norman,** M.A.(HONS.), has been appointed a director of Ferguson Radio Corporation Ltd.

Mr E. J. Carroll, C.A., who has been with the Eire Electricity Supply Board at Dublin since 1930, has gone to Rangoon, where, at the invitation of the United Nations, he will advise the Electricity Supply Board of Burma in the capacity of expert adviser for a period of 12 months. As management accountant he will advise on the improvement of existing financial controls and accounting techniques.

OBITUARY

Mr T. Yule, M.ENG., M.INST.C.E., M.I.MECH.E., M.INST.F., A.M.I.E.E., chief project engineer, Southern Project group of the CEGB, died in a car accident on 23 Nov., aged 61. As chief project officer of that group since its formation in December, 1957, he had been actively concerned in the construction of the Board's first four nuclear stations—Berkeley, Bradwell, Dungeness and Hinkley Point—in addition to numerous other power station projects. Earlier he had been chief generation engineer (construction) to the Eastern Division of the CEGB from March, 1948. His early experience was gained with Metropolitan-Vickers Electrical Co., with whom he was engaged on erection contracts at home and abroad. From 1933 to 1938 he served in the Power Department of ICI Ltd., and later held various appointments with the Sheffield Corporation Electricity Department. After a short period in 1943 with the West Midlands JEA as assistant resident engineer at Ironbridge power station, he joined the Brighton Corporation Electricity Department in January, 1944, as power station superintendent and became deputy engineer and manager in the following year.

Mr E. A. Hall, managing director of the Grimsby electrical engineering and contracting concern of that name, which he founded in 1906, has died, aged 82.

Mr G. A. L. Jaques, late assistant director of contracts, Air Ministry, died recently. Mr R. B. Giles, M.I.E.E., M.CONS.E., MEM.A.I.E.E., writes: "I was fortunate enough to serve Government interests as one of his colleagues in the capacity of a senior temporary assistant, an association which lasted over five years. He was a man of very considerable ability, and over the years acquired a very deep knowledge of supply matters. His keen, logical mind brought him many advantages and earned him the respect of most of those who really knew him and had long contact with him."

Miss G. L. Entwistle, A.M.I.E.E., formerly a designer of d.c. electric motors and generators with Metropolitan-Vickers Electrical Co. Ltd., died on 18 Nov., aged 69. She was a founder member of the Women's Engineering Society and was its president from 1941 to 1943.

Mr B. W. Handley, a director of C. H. Parsons Ltd. for 40 years until retiring about six years ago, died on 20 Nov., aged 86.

Sir Greville Simpson Maginness, deputy chairman of Tube Investments Ltd., died on 23 Nov., aged 73.

Dr Axel Wenner-Gren, the Swedish industrialist and philanthropist, who died on 24 Nov., aged 80, founded the Electrolux concern in that country in 1920. In the post-war years he turned his attention to the development of the Alweg single-rail transport system (as built in Cologne), and to the natural resources of British Columbia where his Peace River hydro-electric scheme, the subject of an agreement with the Provincial Government in 1957, has now been taken over by the Province.

NEW LITERATURE

Photometric Standards and the Units of Light

by J. S. Preston, M.A., M.I.E.E., F.INST.P., F.I.E.S.

THIS is the twenty-fourth publication in the NPL series "Notes on Applied Science," intended to provide information which is not readily available from other sources. After a brief introduction, referring to the history of illumination standards, the author outlines the photometric scale giving derivations for the lumen and candela. Most of the booklet is concerned with the primary and secondary standards in use at the NPL and elsewhere and discusses in detail how they are set up and controlled. The concluding pages mention some of the shortcomings of present international standards and an appendix describes a possibility for a new standard. Published by HM Stationery Office, 9¼ in. by 6 in. 32 pages. Price 3s.

BOOKS RECEIVED

The Practical Electrician's Pocket-book, 1962, ed. by R. Norris. As usual, there is evidence of much revision in this compact handbook. New sections deal with static control devices, electromagnets in industry, welding, and servicing of washing machines. Published by Electrical and Radio Trading, 536 pages, 5 in. by 3¼ in. Sixty-fourth edition. Price 7s 6d.

Operating Experience With Nuclear Power Stations, by A. K. Krasin and B. A. Semenov. Original Russian text plus English translation of experience gained from operating a number of experimental and industrial types of nuclear power stations in various countries. Published by International Atomic Energy Agency and obtainable from H.M.S.O., 73 pages, 8½ in. by 5¼ in. Price 6s.

Power for the TV centre

COLOUR MIGHT RAISE DEMAND TO 6 MVA

SOON after the resumption of television programmes in June, 1946, it became apparent that, with longer programmes, studio expansion was urgent. In 1949, the BBC acquired the site of the Franco-British Exhibition at White City, and although planning began the following year, owing to Government-imposed restrictions main construction work did not start until mid-1955.

A comprehensive description of the electrical aspects of the centre was given in a paper* presented last Thursday to the IEE. The following summary deals principally with the power and lighting aspects of the centre.

An important consideration in designing the centre was the future possible use of colour television which, broadly, would require 50% more space for the equipment and greatly increased studio lighting, in turn affecting the power supply and ventilation requirements.

The building consists of a circular main block housing equipment rooms, control rooms, production studios and offices. Radiating from this central block will be seven studios, of which four are now in service.

Electrical Demand

Studio lighting forms the bulk of the electrical load, but considerable power is also required for technical plant, ventilation equipment and normal office supplies. For black-and-white operation the lighting load corresponds to approximately 25 W/sq ft, which is appreciably less than required by earlier installations which used less efficient illuminating sources. This lighting load is dictated by camera requirements and provides a normal lighting intensity on the sets of 50 lm/sq ft. The centre has three types of studio; the largest, with an area exceeding 10,000 sq ft, requires a load of 300 kW while the smallest, of 3,500 sq ft, has an estimated load of 90 kW. Single-phase, 240 V a.c. is used for black-and-white operation instead of the 110 V used previously. Colour television would, however, impose nearly three times the lighting loads quoted above, and provision has been made for three-phase supplies to each studio to meet this demand.

Load Estimating

A very important consideration in estimating the loads was the diversity factor to be allowed. Tests taken on existing studios suggested that the load was normally well below 50% of the maximum connected load and only reached 75% for very short periods. On this basis, for black-and-white television, the centre m.d. would be between 3 MVA and 3·5 MVA, rising to between 4 MVA and 5 MVA when the site is completely developed. Colour television might increase the demand to about 6 MVA.

The main electrical supply substation is in the basement and, in the interests of maximum security, supplies are taken from two cable trunk feeders from the electricity board's 66 kV/11 kV bulk supply station. The two feeders have 5 MVA capacity and are operated as a closed ring to supply three 11 kV substations in the main studio block above the scenery runway. The two incoming feeders are fed from a single section of the Board's substation but, to guard against long-term failures, a third 11 kV supply is available from another section of the substation.

Emergency supplies can be obtained from a 100 kVA diesel-alternator set which would supply sufficient power for speech announcements and the operation of one

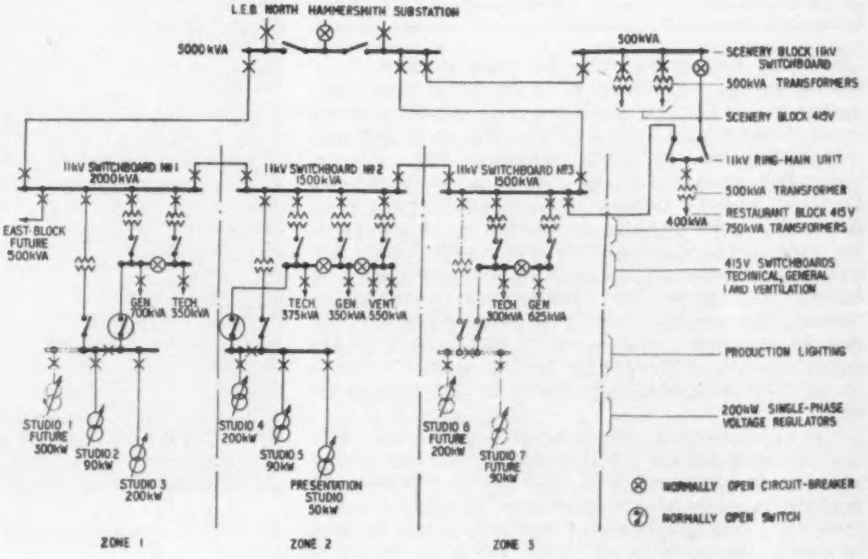


Fig. 1. Simplified line diagram of the BBC TV centre distribution system. Supplies are obtained at 11 kV through two cables from one section of the Board's substation. A third 11 kV supply is available from a separate section of the substation for use if a fault should put both main feeders out of service

* Paper 3786: "The BBC Television Centre and Its Technical Facilities," by F. C. McLean, C.B.E., B.SC., H. W. Baker, O.B.E., and C. H. Colborn, B.SC., Members.

telecine machine for a single programme. A feature of the installation is that all 11 kV switchgear is controlled from a board in the central apparatus room area and, if the maximum demand exceeds the estimated required value, warning is given so that non-essential loads can be shut-down.

Switchgear and Transformers

The main 11 kV switchgear has a fault capacity of 250 MVA and is solenoid-operated, oil-filled. Dry type, Class H insulated step-down transformers rated 750 kVA, 11 kV/415 V are used to reduce fire risk. These transformers are mounted as close as possible to the main load centres at a fairly high level and are fitted with anti-vibration mountings to prevent troubles from vibrations transmitted through the building structure. Outgoing circuits from these transformers are controlled by remotely operated air circuit-breakers with 25 MVA fault capacity. For general sub-circuit distribution, cubicle-type switch fuseboards with rotary switches and horizontal-isolation features are used.

Single-phase studio lighting supplies are obtained through automatic voltage regulators giving voltage control to $\pm 1\%$ for an input range of -12% to $+6\%$. These regulators are also of the dry type. For arc lighting and back-projection equipment a 55 kW, 110 V d.c. supply is provided from germanium rectifiers.

Studio Lighting

In contrast with the offices and general areas, where fluorescent lighting is universal, none is used in the studios. The studio lighting is by tungsten lamps except for a limited number of arcs. A number of special fittings have been developed for the studios and all fittings are suspended from 9 ft long bars with electrically driven hoists for lowering to studio floor level. Fittings are adapted for pole operation for pan, tilt and focus, and all lighting circuits are routed to a patching panel in the dimmer room.

Lighting equipment for an intermediate size studio of 8,000 sq ft

Lighting hoists	104	2 kW switched-only channels ...	10
2 kW outlets, 240 V	490	500 W spotlights	80
5 kW outlets, 240 V	20	2 kW spotlights	80
250 A d.c. outlets, 115 V ...	12	5 kW spotlights	12
2·5 kW auto-transformer dimmers	120	2 kW soft lights	50
5 kW auto-transformer dimmers	18	Cyclorama lights	110

Although not mentioned in the authors' paper, it is noteworthy that the decision to rig the fittings from floor level and to use patching panels, contrasts with the arrangements chosen for the Granada TV studios at Manchester.

Variable auto-transformer dimmers with electro-mechanical servo-control are used in preference to thyratron, magnetic amplifier or silicon-controlled rectifier dimmers. Dimmer controls are mounted on a console in the vision control room, and immediately above this console is a mimic diagram showing the condition of all lighting circuits in use. Two potentiometers on the dimmer channel allow two lighting levels to be stored and there are also 20 memories available for all the channels in the combination. In addition to the lighting hoists, the studios are provided with electrically driven hoists for flying the scenery.

The air-conditioning plant is designed to deal with lighting loads up to 300 kW in a large studio and a temperature at studio floor level of 73°F. With colour television, the temperature would be slightly higher. The air-conditioning installation includes electrically operated volume dampers to control the incoming air, which enters the studios at three levels. For the intermediate size of studio with an area of 8,000 sq ft, the air-conditioning plant absorbs 31·5 kW of electrical power, and an additional 152 kW is required for the refrigeration unit supplying three studios.

The concluding paragraphs of the paper referred to future developments. The centre layout has been based on the assumption that a second programme will be operated in black-and-white. Where possible equipment has also been designed to be suitable for easy conversion to 625 lines. Colour could also be introduced with minimum difficulty.

DISCUSSION

Much of the discussion was concerned with the television equipment rather than the power installation equipment, although in opening the discussion SIR HAROLD BISHOP (BBC) said he would have liked to have seen more emphasis placed on the quite considerable power requirements of the centre. The centre, he said, had proved a complete success, despite the unusual shape of building chosen and delays during its construction. He emphasised the difficulties of the studio design engineer who had to plan for possible technical developments up to three or four years ahead, the time required for bringing a studio into operation. The BBC hoped to do two and possibly three programmes. For these, 12 studios would be needed. Eight were now in use, but these were almost fully occupied. Transmission time amounted to only about four hours per week per studio and this seemed to be about the maximum possible at present. He commented on the use of automatic control in the studios, saying how important it was to try to reduce the manpower requirements.

MR B. N. MACLARTY (Marconi WT) was not convinced of the advantages of the barrel system of suspension for studio lighting and commented that the grid system with the lights suspended from telescopic droppers, although more expensive in initial cost, appeared cheaper in running costs and also kept the studio floor clear, since lamp changing could be done from a gallery. He added that he was disappointed to note that transistors were not used in the installation at the centre.

In reply, the authors commented that demand had so far attained 2 MVA. The figure of 6 MVA quoted in the paper was very indefinite since it necessarily made assumptions about technical developments over the next few years. It was quite possible that the load would not exceed 5 MVA. The authors also confirmed their good opinion of the barrel system for lighting suspension, saying that, at the Centre, there was no question of increasing the setting time required. The telescopic system also seemed to require more staff, but consideration was being given to its use for a limited number of lamps to meet last minute studio lighting requirements.

Power for Sudan Textiles

ELECTRICAL power for an integrated textile mill, formally inaugurated last week in the Republic of the Sudan, is supplied by five 1,480 kW English Electric diesel generators. The generators are driven by four-stroke diesel engines, the exhaust gases passing to waste-heat boilers where they produce steam for various dyeing and finishing processes.

Claimed to be the largest mill in the Middle East, the £6 million mill has been built by a consortium led by English Electric, Marples, Ridgeway and Partners, and Platt Bros. It is situated at Khartoum North. The electrical installation includes 2,500 motors driving spinning and weaving plant, and specially designed lighting fittings. To ensure the correct atmosphere in the mill, an extensive air conditioning plant is provided.

The mill has been brought into use only two years after the formal foundation stone laying ceremony was performed.

Safety clearances for live line working

A.I.E.E. PAPER ON SAFEGUARDS WITH E.H.T. SYSTEMS

IT is inevitable that, even on the highest operating voltage overhead lines, a certain degree of maintenance must be done with the lines alive. Direct contact with the line is, of course, prevented except through insulating poles or handles of adequate dielectric strength and flashover length, but there is always the hazard of the operative's limbs or some non-insulated tool in his hands coming within flashover distance and this must be allowed for in setting down the minimum approach distance for safe working. Since he is, however, even then working in a highly charged electrostatic field, he is liable to experience voltage-equalising discharges to adjacent metalwork at a different potential which, though not in themselves harmful, can cause him to suffer slight muscular reactions which could cause secondary accidents.

Limits of Approach

The results of a study by two engineers in the employ of the Hydro-Electric Power Commission of Ontario, Canada, were the subject of a paper* presented at the AIEE Fall General Meeting in Detroit last month. The study included live-line working on 460 kV transmission systems and commenced with suggestions for the setting down of the limit of approach as the product of the spacing of a phase-to-tower flashover gap at the highest transient peak voltage which is liable to occur and an arbitrary safety factor, plus an additional safety margin to guard against inadvertent over-reach by the linesman.

The actual transient switching surge must be calculated or determined by model studies and the spacing is then taken from the graph in Fig. 1 in which values between various termination forms are as reported in recent literature both in the USA and USSR. The factor of safety is suggested as 1·25, since previous studies have indicated that reductions in flashover voltage through atmospheric and other random causes does not exceed 25% of the average value. This may seem conservative in view of the fact that the highest over-voltages are usually high-frequency transients and that the lowest of the spacing/flashover graphs "F" in Fig. 1 has been taken as the basis. Actually, the condition that is more representative in most cases is the rod-to-tower discharge distance, which is not far different from the rod-plane line, 2, on the graph.

As regards the additional safety margin, it has been thought that a linesman is not likely to misjudge his distance by more than 3 ft and this figure is recommended, though in exceptional circumstances it may be reduced if other compensating precautions are taken.

* Paper 61-1019: "Safe Clearances and Protection Against Shocks During Live-line Work," by A. Elek and J. W. Simpson.

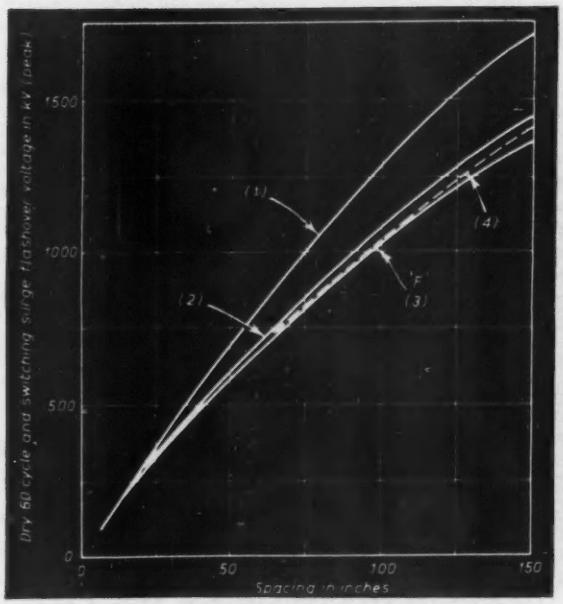


Fig. 1. Flashover voltages of air gaps. 1, rod-rod; 2, rod-plane; 3, adopted basis; 4, grading ring-tower

Determination of Transient Voltage

An over-voltage factor of 2·75 is assumed and it is stated that this is considered adequate for voltages up to 345 kV since there is no recorded instance of the value being exceeded, but higher factors are necessary on 460 kV lines, particularly in the cases where lightning arresters are in the vicinity. The same value may seem high for lower voltage lines but, in fact, surges of this value, though infrequent, are by no means unknown.

The transient peak voltage to be allowed for is, therefore, $2{\cdot}75 \times 230/\sqrt{3} \times \sqrt{2}$ or 516 kV on a 230 kV line which, from Fig. 1, gives a flashover distance of 38½ in. Multiplying this by the over-voltage factor and adding the over-reach margin of 36 in. gives a total minimum clearance of 84 in. Some reduction in this clearance may be allowed if the protective gaps at line terminals are set for lower transient voltages and this, as in all of the submissions, assumes that the over-voltage at any point in the line will not exceed that at one of its terminals. Though not quite valid, it is not so far from the truth as to make the argument inacceptable.

Assuming that the highest switching surge which can occur on a 460 kV line is determined experimentally as 3·2 times line-to-earth voltage, this would require a minimum approach limit of 15½ ft. If, however, 55 in. spark gaps are installed at the terminals, the low frequency over-voltage would be limited to 1·15 times their flashover voltage; that is, 850 kV or 2·25 times line-to-earth volts. The limit of approach can be reduced to 11 ft in such conditions.

Low-set gaps increase the number of interruptions on the line through transients and should be removed when line maintenance has been completed. The table shows some limits of approach for live-line working at various line voltages according to the recommendations.

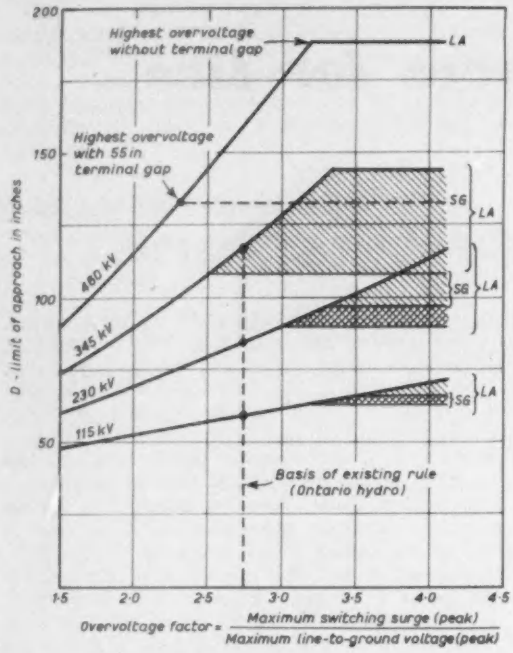


Fig. 2. Relation between limit of approach and the over-voltage factor for lines with and without spark gaps (SG) and/or lightning arresters (LA) at different settings. The Hydro-electric Power Commission's working rule is based on a 2·75 factor. The derived approach limits are given in the adjacent table

System Volts kV	Protective devices at ends of line	Sparkover kV peak	Over-voltage Factor	Limit of Approach ft
115	Lightning Arrester, 18 in. to 20 in. gap	300—495	2·75	5
230	Lightning Arrester, 36 in. to 40 in. gap	560—990	2·75	7
345	Lightning Arresters	725—945	2·75	10
460	Lightning Arresters, normal ...	1,200	3·2	15½
	Set 55 in. for live-line maintenance	850	2·3	11

Electrostatic Discharges

The paper gives some consideration to the subject of electrostatic discharge magnitudes on linesmen while working in the field of conductors, both in contact with the earthed tower metalwork and insulated from it by rubber-soled shoes. The phenomenon occurs as often as the linesman touches the metalwork and isolates himself from it, and laboratory tests have established that variations in the charge on the body by relative movement without touching the metal tower though varying the body-to-tower capacitance do not cause physiological discomfort. Actual discharge by touching the tower is physically perceptible on the inside of the hand if the charge on the body is of the order of 0·4 microcoulomb to 0·6 microcoulomb. The charge must be of the order of 0·8 microcoulomb to 1 microcoulomb to cause involuntary muscular reaction.

Steady state discharge negatives any physiological effects and, from field tests on single-circuit 230 kV and 460 kV lines, it was established that, for comparable conditions, shocks on 460 kV lines are likely to be 3½ times as strong as on 230 kV lines.

The hazard can, of course, be mitigated by using shoes with non-conducting material as the soles, and tests were carried out with commercially available shoes having neoprene soles with resistances varying from 7,000 ohms to 60,000 ohms per shoe. With these, the maximum potential on a linesman working in the proximity of a 460 kV line is about 100 V.

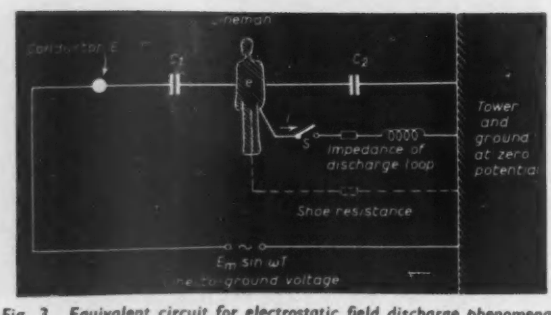


Fig. 3. Equivalent circuit for electrostatic field discharge phenomena with linesman on tower

Forced Air Convection Heating for Flats

WHAT is, in effect, a miniature plenum system has been devised and installed in a block of 42 flats recently completed in Sutton, Surrey. The heating unit, comprising a 1,350 r.p.m., 9 in., GEC porthole-type fan on an HO 6230 11 in. by 11 in. duct air heater, is mounted horizontally in the space above the hall cupboard. A transformation piece ducts the air into a space above the false ceiling which extends the full length of the hall and which serves as a distribution duct to three grilles, one in the main living room and the others in the hall and bedroom. The grilles are so louvred as to deflect the warm airstream downwards and those in the hall and bedroom are provided with shutters which enable the flow to be reduced to a minimum of 20%. Provision for other outlets is also made should the occupant wish to install further background heating.

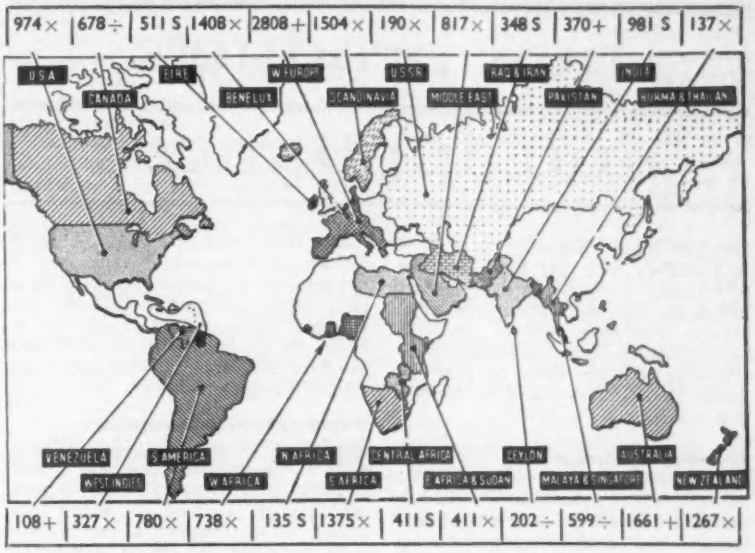
The heating elements are divided into two sections having loadings of 1·5 kW and 3 kW, respectively, each individually controlled by a switch so that a choice of three loadings, 1·5 kW, 3 kW or 4·5 kW, can be made. A separate switch controls the fan so that cool air can be circulated during the summer months. This latter serves as a master-switch giving over-riding control of the heating unit through a 30 A rectified d.c. single-pole contactor of British Klockner make, interlocked with a protective device which interrupts the current to the heater in the event of failure of the fan or other cause of overheating. It also enables thermostatic or timeswitch control to be installed at a later date by the occupant if required.

At full load, the installation will provide about 250 cu ft/min of air heated to 57°F above ambient which is considered to be adequate for direct heating of the main rooms and hall with overspill from the latter to the second and third bedrooms, the flats being of the two- and three-bedroom type. Thermal insulation prevents excessive loss of heat from the ducts and the unit is sound-proofed by glass wool and rubber insulation. Visual warning is provided by pilot lights on the switch panel since the unit is quite inaudible in operation.

The equipment was designed and made by the Lighting and Heating Group of the GEC and installed by Messrs Wm. Willett, of Sloane Square, London.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures



EXPORTS IMPORTS *October*

A GOOD recovery in exports of electrical goods took place in October, the total of £23,625.515 for the items listed in our table being £3¼ million up on the corresponding total for the previous month, but the figure is still some £3¼ million down on that for the best month of this year, for January. The increase was reflected in many branches of the industry, including some sections of the heavy plant side. Appliance exports were also over £300.000 up on the previous month, with sizeable increases recorded for vacuum cleaners, floor polishers and various heating apparatus, but exports of washing machines and refrigerators declined. Even cable exports rose some £550,000 on the month, largely in respect of paper-insulated cables.

Our best customer for the month was again Australia, taking electrical goods with an aggregate value of over £1,660.000, of which £346.022 related to generators and motors, £366,328 to converters, rectifiers, transformers and switchgear, and £76,455 for cables.

On the import side, the total value of £6.190,329 is a record, being over £110,000 up on the previous highest, that for July last. The majority of imports (valued at £1,980.624) came from the USA, with West Germany sending goods to a value of £1.002.894, and the Netherlands some £738,489. Electrical goods from Sweden amounted to £221,343, and from Eire, £192,485.

Description	Exports Value (£)		Imports Value (£)	
	Oct. 1960	Oct. 1961	Oct. 1960	Oct. 1961
Generators:				
Diesel up to 200 kW	200,534	405,755		
Diesel over 200 kW	98,802	170,006		
Steam turbine driven	123,519	50,536		
Water and gas turbines	431,039	406,284	140,898	127,537
With i.c. and other prime movers	31,715	23,107		
Generators up to 200 kW	38,240	91,951		
Generators over 200 kW	60,121	306,026		
Generator parts	471,017	445,630		
Motors, f.h.p.	229,152	271,952		
Motors, 1-250 h.p.	445,796	566,488	294,205	290,316
Other motors	313,563	308,098		
Motor starters and controllers	279,086	344,978		
Converters and rectifiers	154,641	66,220	100,854	142,524
Transformers	679,440	549,911		
Switchgear, to 200A, mv	465,221	462,248	220,998	164,971
Switchgear, other	725,187	974,238		
Total, Electrical Plant	*4,747,073*	*5,443,408*	*756,955*	*725,348*
Batteries, primary and parts	523,716	599,003		
Lamps filament, over 28 V	62,488	111,617		
Lamps filament, under 28 V	28,223	37,647	101,392	125,862
Fluorescent tubular lamps	47,861	115,120		
Other lamps and parts	90 422	126,576		
Radio and electronic gear	3,316,204	4,426,944	1,629,989	1,939,965
Telephone and telegraphic equipment	1,166,996	1,813,902	45,976	77,555
Cookers	40,836	30,863		
Other cooking appliances and parts	145,596	158,059		
Space heaters	37,235	47,936	209,939	273,526
Water heaters	22,221	28,457		
Other heaters and parts	149,758	224,024		
Electric irons	76,500	71,177		
Vacuum cleaners	158,477	259,643	220,320	220,657
Floor polishers	65,318	46,051		
Food mixers	64,199	88,086		
Washing machines, domestic	832,870	587,755	117,984	88,347
Dryers	30,045	32,503		
Washing machine and dryer parts	177,724	156,613		
Domestic refrigerators and parts	553,730	394,520	110,547	30,289
Other appliances and parts	363,994	522,905		
Total, Domestic Appliances	*2,718,503*	*2,648,592*	*658,790*	*612,819*
Portable power tools	183,128	312,781		
Arc welding plant	59,269	107,719	61,560	87,252
Resistance welding plant	10,689	17,482		
Electric furnaces	80,335	255,866		
Signalling apparatus	98,121	100,534		
Commercial instruments	147,489	231,125	108,516	114,222
House service meters	98,434	150,590		
Wiring accessories	146,155	226,351		
Fans	64,653	83,545		
Lighting fittings and lanterns	216,392	361,392	219,987	216,222
Other lighting equipment	58,623	75,587		
Telephone and telegraph cable	198,437	365,882		
Paper insulated cables	381,457	564,034		
Rubber insulated cables	191,520	277,912		
Thermoplastic insulated cables	179,193	338,177		
Winding and similar wires	193,546	185,310		
Other cables and wires	147,818	204,815		
Total, all cables and wires	*1,291,971*	*1,936,130*		
Accumulators and parts	257,249	369,805		
Insulating materials	164,193	200,396		
Industrial electronic control gear	227,159	245,596	78,584	119,577
Electrical ware	100,733	158,335		
Permanent magnets	56,198	82,198		
All other articles	2,382,414	3,387,274	1,724,952	2,171,507
Total	18,344,691	23,625,515	5,386,701	6,190,329

new products and appliances

'Fridges from Philips

MAKING their first entry into the major domestic appliances field, Philips are releasing two refrigerators in March. Distribution will be direct to retailers and the units are being demonstrated to the trade during the next few weeks. *Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2.*

Five-way connector box

AN addition to the range of AEI distribution equipment is a five-way connector box for phase or neutral connections. It is suitable for conductors up to 0·6 sq in. and knock-out diaphragms are at each cable entry. There are two incoming diaphragms at the bottom of the box and three outgoing at the top. The connector block is of tinned brass with bell mouth conductor entries and two brass pinching screws for each conductor. The moulded case, which can be sealed if required, is 2¼ in. long by 3¼ in. wide by 1 7/16 in. deep. *Distribution Equipment Sales Dept., AEI Cable Div., Charing Cross Rd, W.C.2.*

Garbage-disposer improvements

AS well as reducing the price of one of their "In-sink-erator" garbage-disposal units and introducing a new model, Wybourne-Satoba have improved the present versions. The new unit, known as the "Developer's Model," is equipped with built-in reversing gear to release jams, and sells at 39½ gn, plus 12s 10d purchase-tax surcharge. Improvements incorporated on all models include a four-bar rotary shredder to give faster and more efficient grinding, a snap self-aligning under-sink fitting and a dish-washer connection. Model 333 has been reduced from 39½ gn to 36 gn, plus 11s 8d purchase-tax surcharge. *Wybourne-Satoba Equipment Ltd., City Rd, E.C.1.*

Waterproof fittings

A WATERPROOF and dustproof fluorescent fitting is the "Norka Light" from Loblite. It has a glass or Perspex outer tube to protect the lamp and is designed for both ceiling and pendant mounting. The fitting uses a 5 ft 80 W lamp and has two watertight cable-entry glands on the lampholder housing. Silicon rubber sealing rings also assist waterproofing. The unit is supplied wired and ready for installation and has separate chokes and power factor correcting capacitor.

The company are also introducing an all-plastics bulkhead fitting to take a 100 W lamp. The housing, which is insulated, is in brown or white and fixed with four nylon screws.

Also announced is a range of safety devices for socket-outlets. They are in the form of a plastics disc with three pins, which are plugged into the unshuttered socket. They are said to be simple for an adult to remove, but held too firmly for a child. *Loblite Ltd., Team Valley, Gateshead-on-Tyne.*

Rapid resistance calculator

DESIGNED to give rapid calculation of the resultant resistance of two or more resistors in parallel, the Paristor calculator is claimed to supply the answer to an accuracy of better than ±1% merely by the setting of a sliding cursor. Working on the slide-rule principle, it consists of a stock member with a fixed scale and a cursor carrying the required reference lines and moving scales. Any two values of resistance may be selected on a scale and their resultant parallel resistance read off on the same scale against the cursor reference line. Conversely all combinations of two resistances in parallel which will produce a known resultant value can be read up to a resistance ratio of 10:1. In addition a tolerance scale is provided giving limit resistance values up to tolerances of ±20% and power dissipation between two selected resistors can be determined by the use of a ratio scale. Similar calculations to the above can also be made for two or more capacitors in series. Made in white plastics, the calculator is supplied in a plastics wallet and measures 9·6 in. by 3·5 in. by 0·34 in. Price £2 4s 6d. *Paristor Ltd., 96 Park La, Croydon, Surrey.*

Appliances in miniature

READY for the Christmas trade are a selection of toy models of Hoover products. These models, which are now available in toy shops, include the "De Luxe" and "Junior" vacuum cleaners, the "Mark II" washing machine and "Hoovermatic," the steam and dry iron and a scale model of the cylinder vacuum cleaner. Prices range from 3s 6d to £2 9s 6d. The "Mark II" washing machine has a working wringer, which hinges inside the top when not in use, and a crank-driven pulsator. Also realistic is the model "Hoovermatic" with working spin dryer and crank-operated pulsator. *Hoover Ltd., Perivale, Greenford, Middx.*

Cubicles for control gear

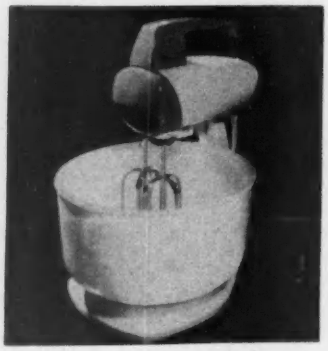
INTENDED to supply the basic shell in which control gear and other apparatus may be housed, the new Imrak electrical cubicle is built from individual press-formed sections of heavy-gauge steel. This unit is louvred for ventilation and has provision for cable entry through the base. Two rear doors are fitted with locks and quick-release hinges, while the front panel is secured on all four sides by OBA captive nuts. Optional features, such as extraction fans, base filler plates and castors, may be fitted to the cubicle. Two types are made, type CR with flat side panels or type ER with lockable side doors, both finished in stove-enamelled grey or dark grey hammertone. Both are available in four heights and four plan sizes giving 32 cubicles with dimensions ranging from 53 in. by 44 in. by 21 in. to 84 in. by 50 in. by 26 in. *Imhof Ltd., Ashley Wks, Cowley Mill Rd, Uxbridge, Middx.*

Burco enter small appliance market

VENTURING away from their established name in laundry equipment, Burco are entering the small appliance market with a food mixer selling at £13 13s 9d including tax. This unit is now being released to the wholesale trade and carries the name "Burcomix."

It is a medium-sized mixer designed to be used as a hand beater or fixed to a stand, the cost of which is included in the price. The mixer is powered by a three-speed motor and uses only one set of beaters; this means that for different applications the motor speed is varied instead of interchanging beaters. Motor speed is controlled by a single-pole switch and the three settings are: high, 750 r.p.m.; medium, 600 r.p.m.; and low, 450 r.p.m.

The body and handle are constructed of "cycolac" which is said to have a higher breakage resistance than other plastics. Twin beaters are of chrome-plated mild steel and they can be ejected by depressing a button on the handle. The stand, of zinc-based alloy, has four rubber feet which eliminate any tendency for the mixer to move while in use. A heat-resistant glass bowl is also included in the cost. The gears are moulded from nylon and the unit operates from standard voltages. *Burco Ltd., Burnley, Lancs.*



Burco's new hand or standard mixer

Multi-frequency sub-standard

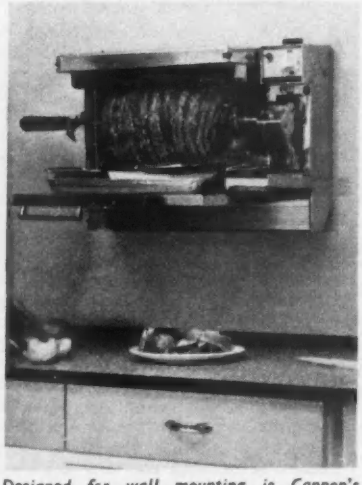
DESIGNED for wherever "on-site" frequency tuning is required, the "Forksichord" is a portable, battery-operated sub-standard giving frequencies in the middle and lower audio range accurate to within ½ cycle. These are produced by vibration of tuning forks, mounted in two rows of eight, being maintained by a three-stage transistorised amplifier. A buffer stage supplies tone to a telephone receiver and by use of the beat method this tone can be used to tune other equipment. Sixteen frequencies ranging from 400 cycles to 1,100 cycles may be selected by means of individual press-button switches. *Westrex Co. Ltd., 152 Coles Green Rd, N.W.2.*

Price cut

LIST price of GEC's HO 6321 thermal block storage heater has been reduced with effect from 23 Nov. The new price for this 2¼ kW model is £24 5s including purchase tax and surcharge. *GEC Ltd., Magnet Hse, Kingsway, W.C.2.*

Wall-mounted spit roaster

THE growing popularity of rotisserie spits as attachments for cookers has been taken a stage further by Cannon, who have designed a wall-mounted model. A feature of this unit is its compact size; when closed it stands out from the wall only 5½ in. and is 14⅞ in. high and 20¾ in. wide. The rotisserie can also be used as a grill with three adjustable positions. Heat is provided by a 2·1 kW tubular sheathed element and the motor, which also folds away, operates on standard voltages at 50 cycles. The spit is said to be able to take a 12 lb turkey. Heat control is by "Simmerstat" and toggle switches are used for motor control. The unit is designed for ease of cleaning, the top is removed for convenient access to the back plate. Also available as an extra at 3 gn is a kebab attachment. Known as "Foldaway," the rotisserie can also be surface mounted and sells at 26 gn. *Cannon Ltd., Deepfields, Bilston, Staffs.*



Designed for wall mounting is Cannon's "Foldaway"

Display packs . . .

Morphy-Richards now supply display packs for their door chimes. These stands can be easily wired and an aperture for bell-push is incorporated in the base.

Designed to display the neat appearance of the fire in use is the latest Ekco display card for the "Malvern" hearth fire. It represents the background of a hearth and is constructed of heavy card in three colours.

. . . Products

Kenton Fluorescent Mfg. Co. have announced a waterproof bi-pin holder in tough rubber. It sells at 3s 4d and is intended for use with fluorescent lamps.

Vent Axia wall-mounted fans are now available with outer casings constructed from "Rockite" dough moulding compound reinforced with sisal.

Control of air supplies

A NEW precision relay has been designed to be incorporated in a pneumatic control circuit where a small variation in air pressure is required to switch a separate air supply from one circuit to another. Advantages claimed, of using an air pressure to control a relay in this way, are the ability to control the switching operation remotely and to monitor on a remotely or locally mounted gauge the pressure about which the relay operates. Controlling pressure range is normally 3 p.s.i. to 15 p.s.i., but the range can be extended up to 100 p.s.i., while the pressure of the air to be switched is 100 p.s.i. maximum. Variation of pressure required to operate the relay is 0·12 p.s.i., with a repeatability of within 0·03 p.s.i. Operation of the relay is assured over an ambient temperature range of −60°F to 180°F. Designated 671A, this model can be used as an on/off controller, operating at preset levels to initiate alarms or, because of its inherent stability, to operate air pressure conscious electrical switches. *AEI Ltd., P.O. Box 1, Harlow, Essex.*

Plastics hose for industry

A PLASTICS vacuum-cleaner hose designed for industrial uses has been announced by Flexible Ducting. It is supplied in light- and medium-duty weights and in seven sizes between ½ in. and 2 in. Called "Flextract," it is constructed of high-strength vinyl reinforced with vinyl-coated spring-steel helix. This is permanently fused to the hose and is said to give a smooth bore and flexibility. *Flexible Ducting Ltd., Ruchill St, Maryhill, Glasgow N.W.*

TRACING INTERNAL WIRING

ALTHOUGH cable location by means of a search coil and indicating instrument has been practised by distribution engineers for many years, the same underlying principle has been adopted in the design of a transistorised portable tracer for use in locating internal wiring cables buried under plaster or floors. The signal from the cable under test is picked up by a search coil incorporated in the instrument and fed to an integral amplifier. A built-in indicating instrument denotes the presence of this signal, which can also be detected audibly through headphones.

Magnetic fields over a wide range of intensity can be detected through the use of a sensitivity control and by reason of the logarithmic scale of the indicator. By setting a selector switch to "Inductive Method" or "Capacitive Method" (in the latter case the search coil is replaced by a capacitor), live conductors can be readily located, regardless of whether current is being carried by the conductor under test or not. Differentiation in signal indication when tracing one or two conductors is shown by a sharp drop over a single conductor and a maximum signal between the two conductors.

The instrument may also be employed as a fault locator. In the event of short-circuited conductors, a current up to 1 A can be injected into the affected circuit from an external source and a drop in instrument deflection will be observed over the site of the fault. Equally, the presence of an open circuit can be similarly detected by using the capacitive method. With two batteries of 1·5 V each, the unit is self-contained. Housed in an unbreakable plastics case measuring 3 in. by 4 in. by 1¼ in., the weight, with leather carrying case, is 12 oz.

Where the circuit under test is close to other a.c. conductors, or when no supply is available as in new buildings, this tracer may be used in conjunction with an audio frequency generator supplying a current at a frequency of 1,000 c.p.s. from external 12 V batteries or accumulator. Mounted in an oak carrying case with a compartment for the tracer, the generator weighs 3½ lb and measures 8½ in. by 4½ in. by 5½ in. *Metrix Instruments Ltd., 54 Victoria Rd, Surbiton, Surrey.*

Left: Audio frequency generator

Right: Tracer in unbreakable plastics case

Materials for Electrical Design

3-D signs

A NEW development in illuminated signs has been introduced by Carson Bros. It is claimed that when the sign is illuminated it gives a true three-dimensional effect. Unlit it can appear as an ordinary daylight sign or mirror. The sign uses two reflecting surfaces placed together, with lettering in varying colours printed on the back of the rear surface. It is then connected to a flashing unit or normal lamp. *Carson Bros. (Productions) Ltd., Honywood Rd, Basildon.*

Permanent recording of vibration

SUITABLE for measurements from either fixed or rotating parts, the Davey hand vibrograph produces permanent records of vibrations on a continuous paper chart over a wide range of frequencies and amplitudes. Held in the hands, the instrument detects vibrations by means of a pick-up pin in direct contact with the vibrating object. Motion is transmitted from the pick-up pin through a variable leverage system to a sapphire-pointed stylus. The stylus records the vibration waveform on a waxed-paper chart, 1 in. wide, which is driven by a governed clockwork motor at a speed of 1¼ in./sec. Pressure of the stylus on the paper can be regulated by a knob in the top of the casing, and a second stylus, actuated by the clockwork motor, provides a timebase by marking a notch on the chart edge every second.

Adjustment of the pick-up pin along a numerated slot gives 40:1, 20:1, 10:1 or 5:1 amplification ratios as required. By means of a three-times graduated magnifier, the recording may be closely examined to determine the amplitude and frequency of the vibration.

Recordings from rotating shafts can also be made using an 8 in. detachable probe and, in addition to hand use, the instrument may be attached to a rigid base. Maximum displacements that can be measured vary from 0·0002 in. at a ratio of 40:1 to 0·125 in. at 5:1. Frequency response of the unit is 1,500 c.p.m. Housed in a portable case, overall dimensions are 6½ in. by 4 in. by 4½ in. and weight is 3½ lb. *Giesler Ltd., River Pl, Essex Rd, N.1.*

The Davey hand vibrograph in use

SILK-SCREENED RESISTORS

RESISTORS of the miniaturised type directly applied to printed circuits can now be applied through a silk screen to a desired pattern with new compositions which comprise specially treated metal powders and glass particles dispersed in an organic solvent. The compositions are made in three values, 500, 3,500 and 10,000 ohm/sq mil thick film. Since a subsequent firing process is involved, the base insulating material must be of ceramic or glass. After firing, the resistor appears as a glossy brown-black film, relatively insensitive to moisture and abrasion and suitable for operating temperatures up to 125°C. They are a Du Pont de Nemours development and are distributed in the UK by *Brown and Forth Ltd., 83-117 Euston Rd, N.W.1.*

PACKAGING FOR FRAGILITY

PACKAGING sheets of F.100 Foamaprene polyester foam, moulded or machined to cradle delicate or fragile electrical components during transport, are now available. The Saville Electric Co., of Broxbourne, have used them for the distribution of infra-red domestic fire heating elements and have found them excellent. *Kay Bros. Plastics Ltd., Marple, Cheshire.*

NEW THERMAL INSULATION

GAS-FILLED polyurethane foam sheeting is claimed to be one of the best and cheapest thermal insulating materials on the market, enabling insulation for refrigerator walls and similar applications to be reduced to close on 1¼ in. thick. Though gas-filled fibrous glass and a fibrous glass supported vacuum offer better thermal performance, they are considerably more expensive. *Owens-Corning Fibreglass Corp., 342 Madison Ave, New York 17, USA.*

SEMICONDUCTING POLYTHENE

A NEW grade of polythene resin with semiconducting properties has been developed for use as an electrostatic shield on certain wires and cables. It is "Alathon 2900 BK 50" and, despite the high carbon content which gives it the properties, it is still resistant to cracking when bent. *Du Pont de Nemours Int. 81, Route de l'Aire, Geneva, Switzerland.*

RARE METAL PLATING

THE deposition of thin coatings of rare metals, such as palladium, ruthenium, rhodium and platinum, on electrical contact surfaces, sometimes referred to as "flashplating," is regularly practised on relays and similar devices carrying low currents at low voltages. Now a new method of plating without an electrical deposition bath has been developed which is also applicable to printed-circuit construction. It is fundamentally a chemical deposition process depending on a chemical reaction between the base metal and the plating solution. The deposit obtained by the process is slightly porous, enabling the thickness of the coating to be built up to relatively large dimensions.

After polishing and degreasing, the parts are immersed in the appropriate stock solution and maintained at the specified temperature for the requisite time, depending on the thickness of the coating required. Afterwards, the part is removed from the bath, washed and immersed in a sealing solution for five minutes, again washed and finally dried. The process was developed by the International Nickel Co. Ltd. and is protected by patents. Marketing is through Engelhard Industries, who will give advice and information on request. *Engelhard Industries Ltd., Baker Platinum Div., 52 High Holborn, W.C.1.*

DUCTILE COBALT STRIP

PURE cobalt coiled strip with good ductility and workability is now available from Canadian sources in thicknesses ranging from 0·005 in. to 0·025 in. and in widths from ¼ in. to 6 in. It is claimed that this is the first time that such grade of strip has been commercially available. Mechanical properties can readily be adjusted by heat treatment, the differences being attributed to the varying proportions in the two crystal forms of the metal which are present. The strip has excellent magnetic properties which are retained to a higher Curie point (1,121°C, 2,050°F) than nickel. Among the promising applications for the new strip are magnetic tapes for computers. *Sherritt Gordon Mines Ltd., 25 King St West, Toronto 1.*

ANTI-CORROSIVE COATING

A NEW plastics coating which is strongly adherent to wood, glass and metal surfaces has recently been introduced here by Plastics and Resins Ltd., of Wolverhampton. It can be supplied as a soft paste or as a decorative paint and it provides full protection against water, alkalis, acids, salt and normal polluted atmospheres. It is resin based and is catalyst cured at temperatures down to 50°F. One gallon covers approximately 45 sq yd and it can be applied by spray, brush or roller.

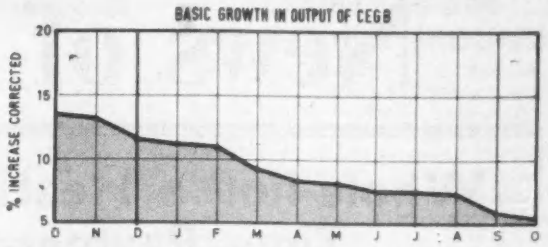
"Pallidux," as the material has been named, is a British development which has undergone several years' development in France, when it was tested as linings and decorative coverings for swimming pools, sealing and protecting cold-storage chamber walls, insulation of electrical power station walls, and in various petrol and chemical situations. *Plastics and Resins Ltd., Wolverhampton, Staffs.*

POWER SUPPLY

Statistics for October

ALTHOUGH sales of electricity have risen sharply since the August trough, neither September nor October show totals very much higher than those for last year. In October, area board sales increases were all less than 8½% and in South Wales, for the second month in succession, sales showed a decline on last year. The national increase in sales of 4·6% becomes 5·4% when corrections are made for weather conditions and the number of working days. This value of 5·4% follows the steady fall in corrected sales increases which has occurred from the 13·2% recorded for October, 1960. The increases in cumulative sales have also fallen month by month since April, when they were 8·5%. For October they were 7·3%. Both the SSEB and the NSHEB maintained their sales increases above 10% for the month.

During October, the CEGB generated 10,106 million units and sent out 9,491 million units. The output capacity of generating plant rose by 112 MW to 28,170 MW as a result of the commissioning of a further unit at Skelton Grange, Yorkshire. This unit comprised a 120 MW Parsons turbo-alternator and an 860 klb/hr Mitchell boiler.



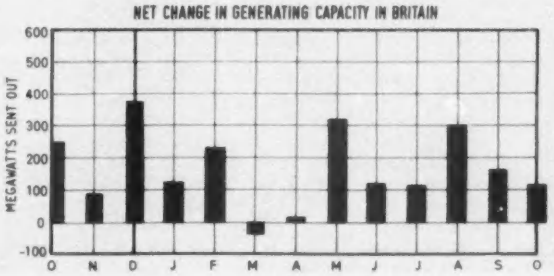
Generation by the NSHEB was 61·9% higher than in October last year at 311 million units. The increase was mainly due to an increase of 102·4% in generation by water power to 305·2 million units. Hydro generation by the SSEB was also nearly 200% higher than in October, 1960, and the total generation by water and steam plant amounted to 606 million units of which 572 million units were sent out to consumers. To meet the SSEB district requirements, an additional 227·6 million units were taken from the NSHEB and from the UKAEA Chapelcross nuclear station. No new plant was commissioned by either of the two Scottish boards during the month.

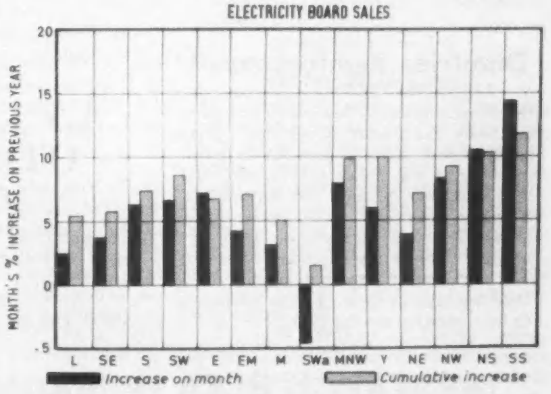
The consumption of coal by the three boards rose by 3·7% in October, compared with October, 1960, to 4,670 thousand tons. Of this total 4,378 thousand tons was consumed by the CEGB. Oil consumption fell by 9·4% to 434·6 thousand tons and the CEGB, with 432·3 thousand tons, consumed the majority of this total. Although a relatively small part of the total fuel consumed, there was an 8.5% increase in the use of coke and breeze to 70·5 thousand tons.

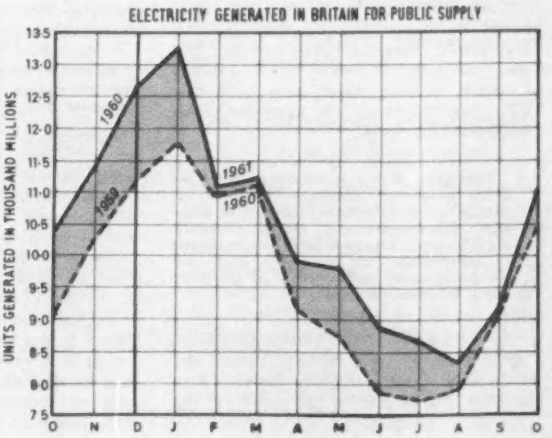
Electricity Board Sales Progress in October

Board	Electricity sent out in millions of units	% Increase October 1960
London	806·4	+ 2·3
South Eastern	567·8	+ 3·7
Southern	771·9	+ 6·2
South Western	359·0	+ 6·5
Eastern	945·2	+ 7·1
East Midlands	776·7	+ 4·1
Midlands	1,015·4	+ 3·1
South Wales	503·9	— 4·7
Merseyside and N. Wales	619·0	+ 7·9
Yorkshire	1,035·5	+ 5·9
North Eastern	570·3	+ 3·9
North Western	1,025·0	+ 8·2
Direct Supplies by CEGB	315·0	+ 0·1
CEGB Total	9,311·1	+ 4·6
South of Scotland	799·37	+14·3
North of Scotland	172·27	+10·4

Table excludes area board purchases from other sources.







News of the Week

Whole-house Heating on Time Payment

Midlands E.B. launch no-deposit, five year plan

BELIEVED to be the first area board to match the oil and coal industries' heating-on-time-payment offers, Midlands EB have begun advertising whole-house heating on no deposit. Repayment is over a maximum period of five years.

They have taken the initiative in arranging finance through the nation-wide Mercantile Credit Co. Because interest on the loan is tax-deductible, the net rate of interest works out at only 5% to a standard-rate taxpayer, the Board are not slow to point out.

Called the "MEB Loan Plan," loans of £100 upwards are offered to home owners and to tenants subject to landlords' agreements.

Since the plan was launched last week, with Press advertisements throughout the Midlands area, around 100 inquiries have been received at the Board's Birmingham headquarters alone. It is still too early to evaluate the response at other service centres throughout the area, but the initial Birmingham result suggests that it will be good.

Bowthorpe and U.S. firm to make connectors here

BOWTHORPE Holdings Ltd. and Deutsch Co., of Banning, California, are to form a jointly owned UK company to make and sell connectors and other products, with Bowthorpe holding a 51% interest. Bowthorpe directors expect that full benefits will not be enjoyed for two or three years.

They also confirm that this move is not connected with the pending acquisition "of a controlling interest in a company whose products are allied to those of a subsidiary" announced last month.

Electrical Engineers' Exhibition Biennial and International?

ALL customary exhibitors at the Electrical Engineers' Exhibition are being asked the following questions:

- Whether they wish the exhibition to be held annually as at present, or every other year.
- Whether they wish the exhibition to be restricted to British exhibits as at present, or to become international.

In the letter which accompanies the questionnaire in exhibitors' letter boxes this week, Mr P. A. Thorogood, organiser of the exhibition, says: "BEAMA have called us into consultation on the question whether the Electrical Engineers' Exhibition should take place biennially instead of every year." The second point, as to whether foreign exhibits should be admitted, was the subject of a questionnaire only last year, when the idea was turned down. Replies to the latest circular are due in by 7 Dec.

Dumfries Reinforcement

A REINFORCEMENT scheme for Dumfries, costing £69,000, is to be undertaken by the South of Scotland Electricity Board. Intended to meet the growing load in the burgh and in particular the proposed housing development at Lochside, estimated to comprise 1,360 houses and four schools by 1966, the scheme involves the provision of a new 33/11 kV substation and certain overhead line and cable work. The scheme is to be completed during 1963.

A.E.I.-JOHN THOMPSON BUY OTHER HALF OF NUCLEAR GRAPHITE COMPANY

THE AEI-John Thompson Nuclear Energy Co., which already holds 50% of the shares of Nuclear Graphite Ltd., is acquiring the other 50% from the Morgan Crucible Co.

This does not imply, however, that Morgan Crucible are losing interest in nuclear engineering. Morgan Refractories continues to be deeply involved with its range of high-temperature pure oxide refractories, while Morganite Carbon supplies borated graphite for biological shields, as at Dounreay, and impermeable graphite for fuel-rod containers, a recent example being the Dragon project at Winfrith Heath.

The number of personnel at Nuclear Graphite's works at Poole, Dorset, has been run down of late as a consequence of the virtual completion of the Berkeley and Bradwell contracts, but it is understood that this trend has halted.

Indeed, if the Nuclear Power Group, of which AEI-John Thompson Nuclear Energy is the backbone, should win the Oldbury contract with their proposal of prestressed concrete pressure vessels, instead of more costly steel, the trend will no doubt be reversed. In any event, the Poole plant will supply machined graphite for Dungeness and expects to have a fairly steady flow of work, so long as graphite-moderated reactors remain in favour.

RESEARCH PLEA IN MAGNET CASE

IF the Restrictive Practices Court outlawed the agreements operated by the Permanent Magnets Association, co-operative research would be impossible. Counsel for the Association told the RP Court this when the agreement was considered last week.

Functions of the Association could be listed under six headings, he said: a patents' pool; complete exchange of technical information; a central research organisation; responsibility for exchange of information as to costs; work on standardisation; and control of prices at which magnets were sold.

In the UK there are 16 manufacturers, none large. 13 were in the Association. Overseas, it was alleged, magnet production was largely in the hands of big, powerful companies. This made co-operation between British manufacturers particularly important.

A levy of 1% of turnover was paid by PMA members to support a central research organisation. The larger PMA members considered that the research organisation should be closed down if the agreement was ruled against, the Court was told. They would want to increase the size of their own research staff. Smaller members would want it kept in being as an information centre.

The price agreement operated by the PMA involved a margin on the average of members' costs to give 20% profit in selling prices. Recommended prices tended to become minimum fixed prices for bulk buyers. The prices were not fixed so that the least effective producer made a profit. Some companies had made losses on the basis of fixed prices.

More Glass Manufacture Integrated by A.E.I. and G.E.C.

FURTHERING their plans for co-operation in the manufacture of lamp and lighting components, AEI and GEC announce the formation of another joint company, Glass Tubes and Components Ltd. This company, whose issued capital of £2½ million is equally owned by AEI Lamp and Lighting Co. and GEC, will take over their glass manufacture and glass sales not already covered by the long-standing partnership, Glass Bulbs Ltd., for bulbs of popular sizes. Lamp Caps Ltd., and more recently Lamp Metals Ltd., are other partnerships in this field.

* * *

SIMULTANEOUSLY, GEC announce a realignment of their Lighting and Heating Group and Installation Equipment Group as part of the major reorganisation which will eventually convert the GEC parent to a holding company. The activities of these two groups have been merged into GEC (Lighting and Equipment) Ltd. This new company supersedes GEC (Lighting and Equipment) Holdings Ltd., formed a few weeks back, which would have operated the Lighting and Heating Group and the Installation Equipment Group as separate entities. The latest move follows considerable progress with the reorganisation of these two groups, a GEC spokesman explains.

The new company will control seven factories at Birmingham, West Bromwich, Wolverhampton, Iver (Bucks) and Rickmansworth. The total number of employees exceeds 5,000.

Control of Electronics Firm Passes to U.S.

TREASURY consent has been given to a scheme whereby control of Brush Crystal Co. Ltd., of Hythe, Southampton, will be transferred from Charterhouse Industrial Holdings Ltd. to Clevite Corporation of the US. The announcement by Brush Crystal states that the step is being taken so that the company will benefit more fully from the association with Clevite, hitherto the largest minority shareholder, but they decline to disclose whether Charterhouse retain any interest.

Brush Crystal are specialists in crystals and ceramics for pizo-electricity, and also make semiconductors. For a considerable time there has been a technical exchange with both Clevite and Clevite's German subsidiary, Intermetall, of Freiburg, who are said to be the principal independent manufacturers of transistors in the Common Market.

Instant Water Heaters Under Fire

THREE instantaneous water heaters come under fire from the Consumer Advisory Council in the most recent issue of *Shoppers' Guide*. The Council found that all three heaters which they tested had "serious drawbacks." One did not comply with IEE Wiring Regulations, another had unsatisfactory earthing arrangement and the third had a secondary safety switch which did not operate in a misuse test. The three units, "Super Clage," "Hewi" and "Jackdaw," which should have given limited quantities of hot water quickly, were found to take between 8 min and 9 min to fill a 1½ gal bowl with water at maximum temperature for the heater, between 142°F and 168°F. When this time was reduced to the minimum—between 2 min and 4 min—water temperature was found to be lower than blood heat.

In the same issue of *Shoppers' Guide* the Council comment unfavourably on the activities of door-to-door salesmen of electric central-heating systems. The Council have obtained an estimate that the capital costs of purchasing and installing a system through a member of the ECA could be nearly £70 to £100 cheaper than dealing with the door-to-door firms.

Britain's only working salt mine at Winsford, Cheshire, has been equipped with Atlas fluorescent lighting. 8|9 lumens|sq ft is obtained from the "Atlantic" single 8 ft batten fittings with anti-corrosive paint finish and starter switch control gear. Reflector-type white tubes are used

REFRIGERATORS HOLD THEIR GROUND

INCLUDING Scotland for the first time, the monthly statistics of appliance sales by area boards, released by the Electricity Council, show that refrigerators continued to do well in September. Settling down after the July rush to beat the p.t. increase, sales were 12·2% higher than a year earlier, virtually maintaining August's 12·7% lead.

Immersion heaters performed better than in recent months, the 15·3% gain on a year ago comparing with August's rise of 1·8%, but washing machines slipped below last year's level, while cookers sold steadily. Comparisons are based on area boards throughout Great Britain, but of course these sales represent only part of the nation's total.

Appliance Sales by Area Boards	Sales in month ended 30 Sept., 1961		Sales in 12 months ended 30 Sept., 1961	
	Total	% change over Sept., 1960	Total	% change over previous 12 months
Cookers ...	35,100	+1·9	404,821	+ 3·9
Water Heaters:				
Immersion	21,099	+15·3	236,356	+ 7·9
Storage ...	5,549	−10·6	69,079	− 7·6
Washboilers	5,053	−11·6	59,390	− 6·9
Washing Machines ...	9,660	− 5·5	112,345	−18·1
Refrigerators	9,758	+12·2	151,103	+ 0·7
Clothes Dryers* ...	2,724	−39·3	50,980	not avail.

* England and Wales only

Radios Edge Lower

DUE probably to the onset of autumn, sales of radios eased back in September from the very high level of the summer months, latest figures from the RTRA show. The average sales per shop were 15·1, compared with 20·9 in August, but were still higher than the 13·2 of September, 1960. With the predominance of transistor models, radio trading is likely to prove more vulnerable to seasonal fluctuations.

TV sales showed a reverse trend, though possibly for the same reason. They edged 0·4 higher than in August to 5·8/shop, but failed to measure up to the previous September's 7·7/shop. Radiograms and tape recorders showed marginal increases to 1·5/shop and 1·8/shop, respectively.

Additional Projector Lamp Factory

INCREASED demand for many types of projector lamps has led AEI Lamp and Lighting to set up a new plant at Stansted Mountfitchet, Essex, to manufacture valve base and 12 V 100 W miniature projector lamps. This factory will be supplementary to the company's main projector lamp works at Ponders End, Middx. The factory will employ a total of six male and 120 female operators and the female labour will be recruited locally.

BROADER CLEAN AIR EXHIBITION

ALONG with a change of name, the scope of the Clean Air Exhibition at Harrogate next year is to be further widened.

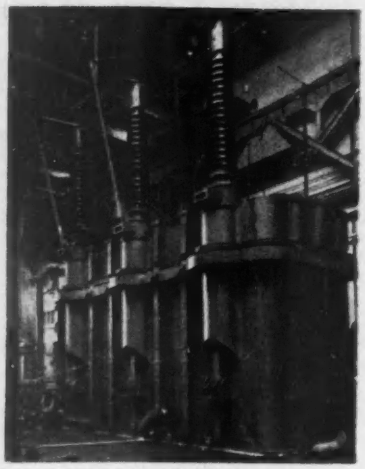
Its new title, "The Clean Air Fuel Efficiency and Domestic Heating Exhibition," is intended to give a clearer indication of the scope of the exhibition which it is hoped will attract visitors other than delegates to the conference, which is to be held in the adjacent hall at the same time.

All forms of heating will be included and provision has been made for about 60 exhibitors, but judging by manufacturers' response to date, it may be necessary to increase that space, we are told by the National Society for Clean Air who are organising the exhibition.

By including the theme of fuel efficiency, it is anticipated that the exhibition will provide opportunities for manufacturers to show their equipment and meet representatives from industry who are not attending the conference. Similarly, it is hoped that the domestic heating aspect will interest housing authorities.

The lesson of experience in railway electrification

PROGRESS with 50-cycle traction on British Railways is the subject of a lecture now being given to railway engineers in various cities in India and Pakistan by Mr S. B. Warder, chief electrical engineer of the British Transport Commission. His visit has been arranged by the UK Railway Advisory Service, in collaboration with the BTC and the Institution of Locomotive Engineers. This is part of an effort to offset any unfavourable impression created by the mishaps to BR's dual-voltage system.



This 225 MVA, 16/285 kV generator, ready for loading at the Bruce Peebles works last week-end, is one of two ordered for the Kincardine power station.

NEW B.E.A.M.A. DIRECTORY LAUNCHED

THE first edition of a new 495-page BEAMA Directory, specifically intended for export markets, has been issued this week, price £3. It is a compact type of classified buyers' guide, with a cross-reference system to enable foreign readers to locate the sources of supply of over 1,000 items of electrical equipment made by BEAMA member-firms. The foreign language reference section is in French, German, Portuguese, Spanish and Russian.

Launching the new directory on Tuesday, Mr L. H. Short, chairman, BEAMA Export Panel said exports of British electrical and engineering goods increased by 10% in the first nine months of 1961, with exports to the Common Market countries rising by 45%. But it was necessary to further develop contact with some areas, particularly in Asia and Latin-America.

Study groups were also making special surveys of particular markets.

E.T.U. Strips Executive of Powers

AS anticipated, the new executive council of the Electrical Trades Union which takes office in January, has been shorn of most of its powers. By a decision at the Rules Revision Conference on Monday supreme authority will in future rest with the annual delegate conference. Commenting on this, afterwards, Mr F. Foulkes, president, said "I would much rather they (the members) took decisions, after leadership given by the executive, than that the executive council should take decisions on matters of high principle."

It was also decided that full-time officials suspended by the executive will have the right to appeal to the annual conference. (Thus, should Mr F. Foulkes be dismissed by the new executive he could appeal.) In addition, full-time officials of ten years' service or more will be entitled to continue until retiring age.

Another major change in the Union rules agreed related to balloting procedure—the subject of earlier legal action. In future, ballots will be taken out of the hands of the Union's head office and branch secretaries, and transferred to a firm of accountants. But members who wish to vote will have to apply for ballot papers and then return their vote forms—involving postage.

In a further major change, the rule prohibiting members from issuing circulars relating to the conduct of the Union or the conduct of its officers or members to other branches except by permission of the executive council, was deleted.

This could lead to a barrage of propaganda against the new executive.

Plan Within a Plan for Scotland

THE 81 answers on what to do about Scotland produced by the Toothill Committee of Inquiry into the Scottish Economy last week steer well clear of electricity supply, which is the subject of their contemporaries, the Mackenzie Committee. Instead, they deal with the general questions of regional development and population, industrial relations and education, communications, national planning and management.

A highlight of the report is that it would be a disadvantage, on balance, to transfer economic and industrial functions from Whitehall departments to Scottish ones, but it is also recommended that a new economic planning department should be set up under the Secretary of State for Scotland.

This ties in well with the main emphasis of the report that the initiative for improvement of the economy must come from inside Scotland, and that the thinking of the country must be turned towards growth instead of propping up dying industries. To set things going in this direction, the chairman, Mr J. N. Toothill (Ferranti Ltd.), says Scotland needs a bigger share of the national cake to spend over the next two or three years.

J. and F. STONE CHANGE BONUS PLANS

DIRECTORS of J. and F. Stone Lighting and Radio Ltd. have dropped their plans to make a free issue of shares in a separate property company, but shareholders need not be disappointed for the firm is making a one-for-two bonus issue in the parent company. The property company will still be created to take over the group's freeholds, but will remain a fully owned subsidiary.

This changed method of passing on to shareholders some of the benefit of the excess of real value of properties over the book values has been adopted because of taxation and other complications contrary to shareholders' interests. Leasehold properties also would show a large surplus on revaluation, but are not being transferred.

City rumour has it that Mr J. James, the Broadmead radio-TV millionaire who is leaving Firth Cleveland, is examining a list of J. and F. Stone shareholders, and that the bonus issue is a protective measure. In response to this, Mr Bassett, of Stone's, says there has been no takeover approach, but that the bonus kills two birds with one stone, both benefiting shareholders and making a takeover more difficult. And, of course, as far as the separate property company is concerned there is a third bird—the tax advantage.

USE PERSONAL TOUCH IN EXPORTS, S.I.M.A. TOLD

THE personal touch can play a great part in exporting, members of SIMA were told by Sir Charles Flitton, past president of the Institute of Export, at their tenth convention recently. The matter of exporting does not end by being friendly with the agent, this must be extended to the customer.

Exporters need to gain long-term confidence from their overseas customers and pay attention to the paramount needs of quality and delivery dates.

Mr N. Knowles, Commercial Attaché to the American Embassy, outlined the growing market of the United States. He advised SIMA members to study population increases in various States and then to sound out the market. "If you cannot sell your goods in Florida, you may find Arizona will buy," he said. The exporter must know who buys, where they are, why they buy and what they buy. On this basis, representation and agencies have to be calculated.

He predicts, in the next few years, the disappearance of the word "export" and the inception of the idea of Europe and America as one vast market of 500,000,000 potential consumers where divisions will be in selling areas.

The purchasing power of Sweden is concentrated in seven towns, stretching from the west coast to Stockholm on the east coast. In the two big towns in southern Sweden, 33% of the total population is concentrated, and here is gathered 41% of the country's purchasing power. Business in scientific instruments and electronics equipment rose by 30% between 1955 and 1960; of this, West Germany supplied about one-third. A loud complaint from Sweden is that British producers do not visit the country often enough. In 1959, for every one British exporter going to Sweden there were three Germans.

Those exporting to Australia should not take the attitude that "Australia knows all about us, we must concentrate on the Common Market," Mr P. B. Horne, Trade Commissioner to the High Commissioner for Australia, said.

OFFICIAL PUBLICATIONS

Electricity Supply and Distribution. DSIR Factory Building Study, No. 10. HMSO. 3s 6d.

A Note on Hong Kong. 20-page booklet. FBI. 8s (see page 826).

ERA Publication: Electromagnetic Screening. J. Miedzinski. 36s.

OFFICES ACT DELAY

THE Government's main reason for delaying regulations under the Offices Act was the prospect of a "comprehensive Bill" to be introduced in the next Session. Already 120 organisations had been consulted, the Commons was told last week, and there were still a number of bodies from whom information had yet to be acquired. In view of this the Government felt that to consult these organisations for the purposes of a partial Act and then go back to them a second time when the comprehensive measure was introduced would be wasteful. It would take several months to make consultations and a further period before the regulations were enforced. This being so, regulations under the existing Act would catch up with regulations necessarily made anew under the Government Bill. This Bill would take into account regulations for offices, shops and railway premises.

Service For Turbines

A NEW subsidiary within the Castrol group, known as Bladite Ltd., has been formed to provide a comprehensive treatment service to industry. This concern will provide a service, within the power station, for the removal by specialised mechanical means of the silica deposits which form on turbine-generator blades and diaphragms. While the sets are shut down for the purpose, another Castrol subsidiary, Metal Cleaning Ltd., offer to clean by chemical means ancillary turbine equipment. In addition, the Electrical Division of Castrol Industrial Ltd. can provide transformer servicing facilities, comprising on-site filtration, flushing and oil changing.

Controls for long lorry loads?

CONTROLS on the movements of long lorry loads were hinted at in Parliament last week when the Parliamentary Secretary to the Ministry of Transport said the Government hope to introduce regulations shortly. If this comes into being, loads over 90 ft long will require an order issued by the Minister and other loads will be subject to control.

The Government's original proposals, which met with considerable opposition, have been revised to lessen the burden on industry. It is hoped that they will divert some loads to other means of transport or require them to be split into smaller units. Regulations dealing with this problem were circulated last year and the Government are now considering the objections which arose.

Illuminated guttering "snow coronets," 15 ft in diameter, form the central feature of this year's Christmas decorations in London's Regent St, shown above, left, which were switched on last Tuesday. They were made by W. S. Chrysaline Ltd. The scheme was again prepared by Mr Beverley Pick, who also designed the Oxford St illuminations, seen above, right, switched on last Friday, which are, in effect, giant-sized Christmas tree decorations

A.S.E.E. Modified Diploma Exam

A THIRD subject will be available for candidates for the ASEE diploma examination for the first time next year. "Industrial Electronics and Control" is added to "Electrical Installation Practice" and "Electrical Maintenance Practice" in the examinations to start in March. Apart from the new subject the pattern of the examination has been changed.

Main effect of the change is that Part 1 of the two-part examination is now designed to determine how well a candidate is able to communicate. Emphasis is placed on his ability to record and express his methods and ideas clearly, concisely and in logical sequence.

The candidate can complete the written part of the examination where he likes, using any reference books he wishes.

The second part of the test consists of oral examination. This is based on the assumption that candidates hold the City and Guilds of London Institute's Full Technology Certificate, implying that they have the necessary academic background.

In the oral examination, examiners question him on his written answers to Part 1 and further check his ability to demonstrate, instruct and supervise. Familiarity with Codes of Practice, regulations and relevant British Standards is also tested in this oral examination.

Applications to sit the 1962 examination have to be sent to the General Secretary, ASEE, by 1 March next.

BILL FOR FAIR TRADE PRACTICES

A PRIVATE member's Bill to prevent deceptive and misleading advertising of consumer goods has been presented in the Commons and is due to be debated on 23 Feb. It is also designed to prevent mis-labelling of consumer goods and other unfair trading practices.

Provision for the registration of particulars of financial affairs, control and management of organisations publishing comparative reports on consumer goods is made in a private member's Bill to be debated on 26 Jan. This applies to both corporate and incorporate bodies.

Hong Kong Ranks with Argentina as Export Market

A FIRST-HAND account, that complaints about British deliveries are widespread in Hong Kong, has been brought back by Mr J. R. M. Whitehorn, of the FBI. Spending a week in the colony, after visiting Japan with Sir Norman Kipping, he found that after-sales service also was criticised, but to a lesser degree. On the credit side, more British executives are appearing on the scene of late.

The importance of these visits is accentuated by the highly developed brand consciousness of people in Hong Kong, including the Chinese. An example of this is to be found at Hok-UN power station, where all the generating equipment is by AEI, and the second of two 60 MW turbo-generators carrying on this custom was unloaded during the past week. Our picture shows the first arriving recently.

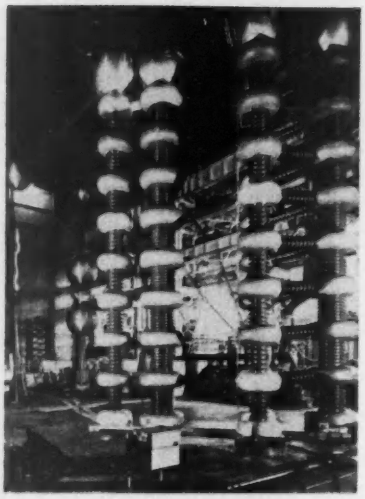
As a market for British goods as a whole, Hong Kong ranks with Argentina, and the analogy holds good for electrical equipment. Last year Hong Kong took £5 million worth of British electrical goods (Argentina £4·5 million), which, interpreted into Hong Kong dollars at the other end, became the equivalent of £11 million, of which only 13% was re-exported. As a gauge of the future market, 40% of the population are under 15 years of age and at present the first million inhabitants are reckoned to have the purchasing power of 100,000 in Britain, the second million that of 250,000, and the third million to rank at par.

In selling to British firms and the Government, the UK naturally has an advantage, but it is a completely free market and the US have recently pushed Britain into fourth place. China is at the top, followed by Japan.

The second of two AEI 60 MW turbo-generators for Hok-un power station arrived during the week

D.C. TEST GEAR FOR RUSSIA

BEING dispatched to the USSR this month is this d.c. testing equipment seen below undergoing a 1,500 kV flashover test at Ferranti's Hollinwood works. One of a number of test plants being supplied to the USSR, it is designed to give an output of 2,000 kV d.c. In the foreground is the eight-stage 20 mA Cockcroft Walton generator, which is to be used for cable testing, and its design is such that it can be operated continuously for periods up to 30 days.



The d.c. testing equipment undergoing 1,500 kV flashover

The generator also incorporates automatic discharge gear which ensures that all capacitors are completely discharged at the end of the tests. The l.t. supply is obtained from an 80 kVA, 500 c/s, 0-400 V single-phase alternator, driven by a 130 b.h.p. squirrel-cage motor. Output is connected to a 400/110 kV, 80 kVA step-up transformer.

SUNDERLAND LINE INQUIRY

THE route of two proposed 66 kV power lines from Riddings Rd, Sunderland, to a new substation at West Boldon was the subject of a public inquiry last week. Sunderland Corporation and the CEGB favoured a route along Sunderland's boundary, but Durham County Council Planning Committee and Boldon UDC considered this would spoil a proposed Green Belt, and suggested a route mainly inside Sunderland's boundary.

The proposed overhead lines would cost £43,000, compared with £148,000 if they were placed underground, which the Board judged impracticable because of likely mining subsidence.

Clerk to the Boldon Council, Mr J. McGillivray, said Boldon suffered from a conglomeration of pylons reminiscent of a Texan oilfield.

The inquiry was conducted by Mr W. L. M. French, of the MoP.

E.P.E.A. 34th DINNER

FIRMLY resisting any temptation to talk about wage pauses or lack of them, the Common Market, or even the relations between industry and the Government, Mr R. S. Edwards, chairman-designate of the Electricity Council, nevertheless succeeded in entertaining guests at the thirty-fourth annual dinner of the EPEA last Friday, by speculating why he had been invited to attend two of the Association's functions within the course of a month.

He concluded that the Association had no ulterior motives, but that, "as engineers who stood astride the world," they felt it possible to be decent from time to time to such people as economists. Mr Edwards was proposing the toast "The Association." In reply, the President, Mr H. J. Fraser, referred to that previous occasion when Mr Edwards had given a very fine lecture to the Association's week-end school.

Turning to the industry, he said we should be proud that we had the largest integrated system in the world. Last year the price of electricity was again reduced by savings made possible of £27 million.

The EPEA, he said, had always been non-political and they, therefore, felt able to criticise the Government of the day. He thought the Chancellor was very ill-advised to put extra tax on fuel oil, and it was difficult to see how this could possibly aid the export drive. Of the top 20 stations, five were oil-burning and any resultant price increase could hardly aid industry. The Chancellor also, apparently, considered the industry's efforts for self-financing inadequate, but, Mr Fraser said, they none the less threw a heavy burden on to the industry.

It was good to find, he said, that in this peculiar world, where countries were spending colossal sums of money to develop the largest nuclear bomb, the CEGB could find peaceful uses for nuclear energy by building six nuclear stations valued at £350 million. These were all the more important because, unlike Sir Christopher Hinton, he felt less assured of the coal industry's future when, for example, 20,000 miners had left since January last.

Sayings OF THE WEEK

"George Bernard Shaw once said that if all economists were put end to end they would never reach a conclusion. He was not right; in fact, he seldom was. If three economists were put end to end the risk was that they would reach three conclusions." . . . MR R. S. EDWARDS, speaking at EPEA dinner.

"Without good sound, even the best of [television] programmes do not have much meaning . . . and some of them don't have much meaning with good sound." . . . MR F. C. MCLEAN, giving a paper to the IEE on the new Television Centre.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, November 28

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	229½	—
" (3 months)	229½	+½
LEAD, refined pig, 99·97% purity (cash)	62	+2½
" (3 months)	63	+2½
TIN, refined, min. 99·75% purity (settlement)	952	−9
(3 months)	960	−8
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4"×4"×54")	193½	—
BRASS Strip 63/37	195½	—
SILVER (Troy oz)	80d	—
ZINC, virgin, min. 98% purity (cash)	71½	+3½
" (3 months)	72½	+3½
RUBBER, per lb		
No. 1, RSS, spot	22½d	−⅛d
c.i.f. basis, ports, Feb. ...	22⅝d	−⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	68½	—
Mild Steel Tape (0·04 in.)	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	59	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	31c	—
Lead (New York)	10c	—

* *Tape Price, now an average, includes varnishing*

LARGE ORDERS AWARDED

THE boiler feed pumps for Ferrybridge "C" are to be made by G. and J. Weir. Worth nearly £1 million, the order is for 12 pumps, including a main feed pump for each of the four 500 MW sets. Each of these four will be a Weir FR 375 six-stage unit driven by a Parsons steam turbine of 13,900 b.h.p., and will have an output of 3,420,000 lb/hr at a discharge pressure of 2,750 lb/sq in. and a suction temperature of 280°F.

AEI's works in Sheffield are to build power equipments worth £2½ million for a further 57 diesel-electric locomotives for British Railways, bringing the total to 233. The latest 57 will be similar to the last 25 Darlington-built machines, when output was uprated from 1,160 h.p. to 1,250 h.p., but this time a new lightweight electric traction motor will be fitted which will increase starting tractive effort from 40,000 lb to 45,000 lb.

AN order which AEI have recently fulfilled was for 16,750 yd of multicore butyl-insulated p.c.p.-sheathed cable for a floating dock built by Furness for Poland. All cables were supplied by AEI, and the larger sizes were manufactured with shaped conductors.

TWO orders which BICC have recently carried out in Scotland totalled over 8,500 yd of m.i. cables. One order, of 5,000 yd, was for the rebuilding of Cardow Distillery, Morayshire, while the other, of 3,500 yd, was for an extension to Arbroath Infirmary, Angus.

SOUTH Wales Switchgear have received a second contract, worth £230,000, for West Thurrock station. They are at present manufacturing and installing the station's l.v. auxiliary switchboards, and the second order is for 35 similar switchboards for sets Nos. 3, 4 and 5.

AMONG the equipment supplied by Laurence Scott and Electromotors for the *RMS Transvaal* are two 5-ton cargo winches, three 2-ton breaking-out winches, and three each of 170/75 h.p. two-speed i.d. fan motors, and 120/52 h.p. two-speed f.d. fan motors.

DAM FOR CHANNEL?

THERE are no Government proposals for damming up the Channel to serve as a source of electrical power as well as a means of transport. It was suggested to MP's last week that this project might be possible in view of Britain's prospective entry into the Common Market.

News in Brief

First examinations for Part I of the certificate of the Institute of Information Scientists will be held at the Northampton College of Advanced Technology on 18 Dec. and 19 Dec.

Aberdare Holdings recently held a two-day sales conference at the Blackwood, Mon, group headquarters.

"Nature's Plastics" is to be the title of a young people's lecture to be given at the IEE, Savoy Pl, at 2.30 p.m. on 5 Jan., by Prof M. Stacey. Admission is by ticket from the Plastics Institute.

Because of a decline in orders for c.r. tubes, the Ravenhead works of Pilkington Brothers is to stop production for three months.

The last 500-mile stretch of the transatlantic section of the Commonwealth telephone cable was laid by the cable-laying ship *Monarch* last week.

Available free from Rist's Wires and Cables is a map showing through roads and motorways in England and Wales. It also has a calendar of sporting events and tips for motorists.

Crompton's "Clenelite" vapour-proof fluorescent lighting fittings have been CSA approved, and several hundred have been ordered for the British Titan Products Co.'s new factory at Tracy, Quebec.

The centenary banquet being arranged jointly by the Plastics Institute and the British Plastics Federation is now to be held on 28 June, 1962.

South Shields TC has decided to scrap the town's trolley-bus service within four years.

Licences to import from Japan, electric clocks, transistor radios and gramophones, are being issued only to previous licence holders under the BoT's interim arrangements.

Company Activities

STUNNED by the "shock" decision of Sir Robertson King to grant wage increases to supply workers, the stock market, which too soon appeared to be rising from its knees, is now more or less back to the flat-on-my-face position! Although Mr Macmillan was swift to denounce this severe threat to the Chancellor's policy of "pause," the damage done may well prove irreparable. Resistance to wage claims this winter would have been difficult enough as it was, but Sir Robertson's awards make resistance well nigh impossible. With the mines and the railways also seeking wage increases, we are now about to witness either a further collapse of the wages pause—or the spectacle of empty grates and deserted stations. Either situation adds fuel to the possibility of a sterling devaluation—though the former much more than the latter—and with this very much in mind the Financial Times index last week took a 10·3 points tumble from 305·4 to 295·1.

There was then a second nasty shock from the electrical world last week when English Electric announced that group profits for 1961 are likely to be "appreciably lower" than for 1960. As recently as June, Lord Nelson was expecting to be able to pay a 7% final to bring the year's total up to a steady 10%, but that hope appears to have gone by the board. It is the familiar story of the squeeze on profit margins. Turnover this year has actually increased and the volume of new orders overall has been maintained. Reaction of dealers on the Stock Exchange, where the EE shares stood at 31s at the beginning of the week, was to knock them down to 26s 3d before some recovery buying lifted them back to 27s.

Naturally, a "power-cut" of this order spread its influence over the rest of the market and GEC, standing at 28s beforehand, finished the week 2s lower at 26s. AEI, who gave a "It must not be assumed that the rate of dividend for the whole year will necessarily be maintained" warning in September, were cut from 33s 6d to 31s 6d.

Elsewhere, J. and F. Stone, the electrical stores chain with over 200 shops, jumped from 29s to 30s 3d on the one-for-two free scrip issue proposal and dividend forecast of equal to 45% against a previous 35% and then further to 32s 6d on takeover talk. On the dull side, Berry's Electric were not quite so magical with a switch-down from 63s 9d to 62s and Plessey lost 9d at 43s 9d.

But it is evident, however much the Electricity Council may blow the fuses, that the electrical market remains very much a storehouse of positive as well as negative charges, although at the moment the investor might be well advised to leave well alone.—*From our City Correspondent.*

British Electric Resistance

Sales rose 16% to a new peak in the year to July, Mr H. Paul-Huhne discloses in his annual report, and as we already know, pre-tax earnings rose by 9%. The only grey point is that, with the exception of Australia, exports were "disappointing." However, it looks as if the steady growth in profit over the past decade will continue, for turnover in August and September was 11% higher than a year earlier.

Crabtree Electrical

The secret of the past year's record profit, when many electrical companies were having a difficult time, is expansion—both of production facilities and turnover. And the secret of the expansion? No doubt partly the recent high level of capital expenditure by industry in general, but the company's performance remains outstanding. This situation is continuing, for Mr J. A. Crabtree reports that output is still at a maximum, despite slackening industrial activity, and plant extensions are going ahead. The balance sheet shows that the liquid position is strong which, in conjunction with a 2½ times cover, suggests that the 12½% dividend rate may be raised when the "pause" ends.

Year to 31 July	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price*	
			Earned	Paid	High	Low
1957	422,000	150,950	40·8	20	26/6	23/-
1958	323,387	112,572	29·7	20	33/9	24/4
1959	437,231	222,752	58·2	20	54/9	27/7
1960	537,536	212,405	27·4	16½†	39/9	23/-
1961	593,162	259,081	33·8	12½	34/6	22/9

*Calendar year except 1961, which is up to 19 Oct.
† One-for-one scrip issue during year; dividend equivalent was 25% compared with 1960.

Decca

The past year's record profit was achieved despite a £700,000 fall in turnover, for which reduced demand for TV receivers was entirely to blame, Sir Edward Lewis told the a.g.m. The radar division had a successful year and is being further expanded.

Dictograph Telephones

The past year's steady profit was not easily achieved, Mr G. D. N. La Niece, discloses in his first report as chairman. It stemmed from record turnover, with higher wages cutting into margins.

Elliott-Automation

Margins, it seems, are not suffering in the electronics industry at least, for directors report that orders and deliveries for the nine months to September show a substantial increase, and profits show a "corresponding advance." Interim dividend stays at 5% on account of the "pause," but an increase in the final payment will be considered.

English Electric

A bleak warning from Lord Nelson has given the market for heavy electricals the shivers. The earlier expectation of maintaining the 10% dividend rate is retracted, and profits for the year are likely to be "appreciably lower" than in 1960. Margins, which were only 4% last year, have deteriorated further, both at home and overseas, and hopes for a recovery by D. Napier, the aero-engine subsidiary, have been disappointed.

Gas Purification and Chemical

The subsidiaries concerned with radio, TV and tape recorders incurred a loss of £192,000 in the year to June, instead of a budgeted profit of £96,500, and this was responsible for the setback to the group as a whole, the chairman reports.

Harland Engineering

Announcing a steady interim dividend of 4%, directors say sales are expected to be about the same as last year, but margins are reduced and final results will be considerably less than for 1960.

Israel Electric Corp.

A "notable expansion" in generating capacity and the number of consumers lifted net profit from £4,388,039 to £5,828,327 in Israeli pounds for the year to March. Dividend is edged up from 7% to 7½%.

Rediffusion

Dividend for the year to March, 1962, is expected to be equivalent to last year's 24%, directors state, calling the meeting to approve a two-for-one scrip issue. This means a final 5%.

Yarrow and Co.

Sir Harold Yarrow discloses in his annual report that owing to the scarcity of marine work, other fields of manufacture are being investigated, and directors expect to report progress in this direction in the near future.

F. H. Wheeler

Terms for the flotation of this electrical contracting firm from under the wing of KG (Holdings) are sent out this week. Shareholders of the holding company are being offered one Wheeler Ordinary 1s share at 2s for every nine KG Ordinaries held on 17 Nov. Even after the issue, however, KG will continue to be the controlling shareholder with 87½% of the voting power. Dealings in the shares are expected to start next Thursday.

Dividends Announced

Richard Johnson and Nephew. Interim 3½% (*same*).

GHP Group. Interim 2½%, as forecast.

Low and Bonar. Interim 5% (*same*).

OVERSEAS NEWS

from our correspondents abroad

CANADA

Appliance Survey

Nearly every household in Ontario is equipped with a refrigerator. Ownership ranges from 94·5% in the western region to 97·7% in the central region, according to a new survey just undertaken by the Hydro-Electric Commission, of Ontario. The data obtained is to be issued early next year in a special booklet for manufacturers and appliance distributors. The survey ascertained the number of appliances in a cross-section of the 1,592,892 homes supplied by the Commission. It gives the percentage ownership of all types of appliances.

W. INDIES

Cable Link

A submarine power cable link between the islands of Trinidad and Tobago is to be installed by British Insulated Callender's Cables Ltd. They have been awarded a £200,000 contract by the Trinidad and Tobago Electricity Commission for the manufacture and installation of 24 statute miles of submarine gas-filled cable together with terminations. The three-core cable will provide Tobago with a 33 kV a.c. supply from the Trinidad transmission system. Rated load capacity of the circuit will be 12 MW. Large resources of natural gas have been found in the south of Trinidad and in the Gulf of Paria, and these are to be utilised in a new gas-fuelled power station. In Tobago, however, the cost of generation is relatively high, and the provision of the submarine cable circuit will permit the future economy of Tobago to be more closely integrated with that of Trinidad. The cable is to be laid in a continuous length from an ocean-going vessel, the route chosen being from Toco Bay, Trinidad, to Milford Bay, Tobago. It will be 70 fathoms at the deepest point.

The 116 sq mile holiday island of Tobago is at present supplied from the 2,200 kW diesel station near Scarborough. The new cable link will enable the Commission to meet the increasing demand from the new hotels there.

HOLLAND

Alumina Plan

A plan for the establishment of a raw aluminium factory in the extreme north of Holland is under consideration by Billiton Mij, the Dutch tin concern. But whether the project materialises seems to be dependent on the utilisation of the large reserve of natural gas found in the northern part of the country last year. The large quantities of electric power needed to deal with the alumina could be obtained from a gas-fuelled 120 MW power station. Negotiations are in progress concerning the price at which such gas could be made available.

SWITZERLAND

Grande-Dixence

The last hopper of concrete was recently poured on the Grande-Dixence dam, situated some 8,200 ft above sea level, in the Swiss Alps. The first concrete was poured about eight years ago, and now the dam is 935 ft high, 650 ft thick at the base, and 49 ft at the top. The two hydro-electric power stations under the scheme are already in partial operation.

HUNGARY

Another Station

A further 600 MW power station is to be built in Hungary—at Gyongyos, 51 miles east of Budapest. This plant will mainly use lignite from a new opencast mine four miles distant, in addition to coal from the northern Nagrad coalfields. Turbines of 100 MW and 150 MW, manufactured in Hungary, are to be installed, with the first scheduled for operation in 1968. The main chimney of the power station will be 200 metres high, with an internal diameter of 10 metres. Since there is a lack of water supplies in the area, the designers are considering the use of the Heller-Forgo cooling system, a Hungarian invention now being used by the English Electric Co. and utilised at the CEGB's Rugeley power station. Hungary's other 600 MW power station, under construction at Szazhalombatta, just south of Budapest, is expected to have its first 125 MW generating set in operation by the summer of 1963.

INDIA

HE Resources

A preliminary survey of the hydro-electric resources of India, recently completed by the Central Water and Power Commission, has shown that the total power potential (at 60% load factor) of about 260 schemes in India, Nepal and Sikkim is 50,000,000 kW. Power potential in India, according to the survey, is estimated at 49,000,000 kW, covering about 240 schemes. The remaining potential is of schemes in Nepal and Sikkim. This survey is based on specific schemes worked out from data available to the Commission. It is expected that this survey will help in drawing up the pattern of power development in future five-year Plans.

Link with US

The General Electric Co., of America, is establishing a company with its own manufacturing plant in India, but initially its products will be confined to specialist items, such as lightning conductors and X-ray apparatus. This was revealed a few days ago by Mr J. H. Gross, GEC vice-president, during a visit to India. A new public company is being formed with the title of International General Electric (India) Manufacturing Co., in which the Tata group will plant.

PAKISTAN

Canadian Aid

The Canadian Government has allocated 7,215,000 Canadian dollars as grant-in-aid for the construction of a 25 MW thermal station at Sukkur, Pakistan. The allocation will take care of the total foreign exchange requirements of the project, which aims at taking electricity to an area of 70 miles around Sukkur. Its capacity can be doubled if and when needed. Preliminary work on the project has almost been completed by the Water and Power Development Authority. The Canadian Government formally agreed to participate in the project earlier this year and appointed consultants to go ahead with the proposals.

Nuclear Report Awaited

A report on the feasibility of generating electricity from nuclear power is expected to be presented to the Government by the Pakistan Atomic Energy Commission by the middle of December. The report has been prepared jointly by the Commission and a firm of international consultants. Dr I. H. Usmani, chairman of the Commission, has indicated that nuclear power generation could be economic for Pakistan. He asserted that in the absence of conventional fuels there were only two alternatives for West Pakistan for generating power for industrial development. These were natural gas and water. Yet despite the country's resources in that connection there would remain a gap between power supply and demand by the end of the present century, which only nuclear power could fill.

AUSTRALIA

Underground Plan

Preliminary work to determine construction methods for Melbourne's underground railway is scheduled for completion by the end of this month. Estimated cost of the railway, which will be served by four underground stations, is put at £A30 million. No firm date has at present been given for an actual start on the excavation work for the railway.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

1 Dec.—Edinburgh. (2) Electrical installation renewal in Simpson Memorial Maternity Pavilion nurseries for Royal Infirmary of Edinburgh and Associated Hospitals. Applications to Ian Hunter and Ptnrs., 46 Palmerston Pl, Edinburgh 12, by above date.

1 Dec.—N.I. Hospitals. (3) Electrical engineering services installation in Villa 2, Purdysburn Hospital. Applications to Secretary, 27 Adelaide St, Belfast, by 5 p.m., on above date.

2 Dec.—Barrhead B.C. Rewiring of 384 houses.—See 16 Nov. issue.

2 Dec.—Huyton-with-Roby U.D.C. Supply: public lighting equipment.—See 23 Nov. issue.

4 Dec.—Brentwood U.D.C. Supply and erection of 61 Group "A" sodium and 67 Group "B" mercury street lighting units on concrete columns. Engineer and Surveyor, Council Offices, Ingrave Rd.

4 Dec.—Depwade R.D.C. Provision and installation of water heaters with plumbing services in 22 bungalows.—See 23 Nov. issue.

4 Dec.—Edinburgh. Electrical maintenance work in City Hospital, Royal Victoria Hospital and Southfield Hospital, Edinburgh, and in Loanhead Hospital, Midlothian.—See 23 Nov. issue.

4 Dec.—Hastings C.B.C. Electrical installation in new grammar school, Parkstone Rd.—Advertised 23 Nov. issue.

4 Dec.—Kincardine C.C. Electrical work in Glenbervie Primary School alterations and additions.—See 16 Nov. issue.

4 Dec.—Lancs C.C. Rewiring of Ashton-under-Lyne Mossley Rd County and Girls' County Secondary Schools. Applications to County Architect, P.O. Box 26, County Hall, Preston, by above date.

4 Dec.—S. Liverpool Hospitals. Period contract: electrical supplies. Secretary, Management Committee, Sefton General Hospital, Liverpool 15.

4 Dec.—Petersfield R.D.C. Supply and erection of Group "A" lighting: (1) 36 columns/one bracket with 140 W sodium lanterns/gear and wiring along London Rd, Liphook; (2) 36 columns with 140 W sodium lighting along London and Portsmouth roads, Horndean.—See 9 Nov. issue.

4 Dec.—Wrexham B.C. Electrical installations, on fixed-price basis, in 108 dwellings. Borough Engineer and Surveyor, Guildhall.

5 Dec.—Bentley-with-Arksey U.D.C. Electrical installations in 37 bungalows at Pipering La.—See 23 Nov. issue.

5 Dec.—Leeds C.C. Supply and erection of 30 g.p.m. at 165 ft head booster pumping plant, complete with switchgear, motors, etc.—See 9 Nov. issue.

5 Dec.—Offaly. (b) Electrical installation extension at Vocational School for Vocational Education Committee. Details from consulting engineers: J. V. Tierney and Co., 15-16 Duke St, Dublin. Deposit £5 5s.

6 Dec.—Down C.C. Electrical installation in central meals kitchen at Dromara. Details from consulting engineer: J. R. W. Murland, 25 Bedford St, Belfast 2. Deposit £3.

6 Dec.—Hoylake U.D.C. Supply of 1,700 solar dial time-switches for street lighting.—Advertised 16 Nov. issue.

6 Dec.—Renfrew C.C. Sub-contract 6. Electrical work in 60 houses at Eaglesham. Applications to County Engineer, 16 Back Sneddon St, Paisley, by above date.

6 Dec.—Skelton and Brotton U.D.C. Electrical installations in 56 houses and bungalows on Marske La housing estate.—See 23 Nov. issue.

6 Dec.—Swindon B.C. Supply of (List BS13) lamps, cables, etc., and (BA9) fittings for year. Details for BS13 from Borough Surveyor, and for BA9 from the Borough Architect, Civic Offices.

7 Dec.—Dundee Harbour Trust. Supply and erection of three level luffing travelling cranes of the portal type.—See 9 Nov. issue.

7 Dec.—Kirkcudbright C.C. Separate trades tender: electrical work in Dalbeattie Primary School alterations and additions. Applications to County Architect: A. Hunter, County Offices, Kirkcudbright.

8 Dec.—Potters Bar U.D.C. Rewiring of 50 houses in Cranbourne Rd.—Advertised 23 Nov. issue.

9 Dec.—Bootle B.C. Supply of (List 13) cables and electrical goods and (14) lamps for year from 1 April, 1962. Borough Surveyor, Town Hall.

9 Dec.—Pomeroy. Installation of Selex heat/light units in All Saints' Church, Townland of Crossdernott, Donaghmore. Details from Rev. P. T. Reilly, The Rectory, Pomeroy, Dungannon, Co. Tyrone. Deposit £5.

9 Dec.—Seaton Valley U.D.C. Electrical installations in 32 houses at Seghill.—See 16 Nov. issue.

11 Dec.—Chelmsford B.C. Provision and erection, on fixed-price basis, of 107 Group "B" columns, lanterns and gear in St. John's Rd area.—See 23 Nov. issue.

11 Dec.—Cornwall C.C. Applications for inclusion in approved list for (Item 18) electrical installations and (20) lifts to County Architect, County Hall, Truro, by above date.

11 Dec.—Darlington B.C. Electrical installations in 46 houses on Firth Moor estate.—See 23 Nov. issue.

11 Dec.—Tunbridge Wells B.C. Supply and erection of 33 Stewart and Lloyds 25 ft steel columns, G.E.C. lamps and lanterns, together with ancillary works for Group "A" lighting along Lansdowne Rd and Sandrock Rd. Borough Surveyor and Water Engineer, Town Hall. Deposit £2 2s.

11 Dec.—Wallasey C.B.C. Electrical installations in three blocks of five-storey flats and maisonnettes.—See 23 Nov. issue.

11 Dec.—Wigan R.D.C. Erection of 255 Class "B" concrete columns and fluorescent lamps/fittings in various parishes. Surveyor, 10 Bridgeman Terr.

13 Dec.—Keynsham U.D.C. Provision and installation of two 180 g.p.m. sewage pumps with motors for Norman Rd housing estate.—See 16 Nov. issue.

15 Dec.—Antrim C.C. (a) Electrical installation in Buick Memorial Primary School, Cullybackey. Details from consulting engineers: J. Waring, 31 High St, Carrickfergus. Deposit £5.

15 Dec.—Beddington and Wallington B.C. Supply and erection of 326 Group "B" Stanton concrete columns/brackets and 60 W Revo lanterns, sodium lamps/gear. Borough Engineer, Town Hall, Wallington.

15 Dec.—Leeds C.C. Trunk road and roundabout lighting: (Contract 3A) supply of 11 35 ft reinforced concrete columns/brackets; (3B) supply of 11 200 W sodium lamps/lanterns/gear; (4A) supply of 26 25 ft reinforced concrete columns/brackets; (4B) supply of 140 W sodium lamps/lanterns/gear.—See 23 Nov. issue.

16 Dec.—Girvan B.C. Supply and fitting of electrical striking movement for town steeple clock and for the replacement of the south dial.—See 23 Nov. issue.

16 Dec.—Plympton St. Mary R.D.C. Installation of 75 street lighting columns and 80 W m.v. control gear at Stentaway estate, Plymstock.—See 23 Nov. issue.

18 Dec.—E.B. for N.I. Specification 1642. Lighting and heating associated with No. 4 boiler and turbo-generator at Coolkeeragh.—See 2 Nov. issue.

18 Dec.—Southampton C.B.C. Electrical installation in College of Technology.—Advertised 2 Nov. issue.

18 Dec.—Tonbridge U.D.C. Supply and erection of sewage pumps: two 300 g.p.m. at 28 ft head; two of 450 g.p.m. and two of 900 g.p.m. at 42 ft heads.—See 16 Nov. issue.

18 Dec.—West Riding C.C. Rewiring of 2 to 8 Bond Terr, Wakefield.—See 23 Nov. issue.

19 Dec.—Abergele U.D.C. Installation of 176 140 W sodium and 13 250 W mercury lighting points in Water St and Dundonald Ave, Abergele; Marine Rd and Towyn Rd, Pensarn; Towyn Rd, Towyn; and Foryd Rd, Kinmel Bay. Engineer and Surveyor, Town Hall, Pentre Mawr.—Advertised in this issue.

19 Dec.—Mynyddislwyn U.D.C. Erection of columns, supply and erection of brackets/sodium lanterns/lamps/gear and wiring complete, on fixed-price basis, of 1¼ mile of Group "A" lighting, Plough Inn, Penmaen Rd to Penmaen. Engineer and Surveyor, Council Offices, Pontllanfraith, Blackwood, Mon. Deposit £2 2s.

20 Dec.—Manchester C.C. Electrical installation in Miles Platting Secondary School. City Architect, P.O. Box 438, Town Hall.

27 Dec.—Ealing B.C. Electrical installation

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 108 queries answered this week

"Celec" sliding dimmer controls—makers of? S.W.I.—Curtis Manufacturing Co. Ltd., 26 Paddenswick Rd, W.6.

"Nevastick" kitchen utensils—makers of? S.E.E.B.—London Aluminium Co. Ltd., Holloware Div., Charles Henry St, Birmingham 12.

"Lico" laboratory plugs and sockets—makers of? B.E.E.—London Instrument Co. Ltd., Newnham Mill, Cambridge.

Battery operated whisk—makers of? E.E.W.—Pifco Ltd., Watling St, Manchester 4.

"Premier" irons—address for spares? J.L.—A.E.I.-Hotpoint Ltd., 11 Avon Trading Estate, Avonmore Rd, W.14.

"Hovenden" hair-dryers—address for spares? E.E.C.—Osborne Garratt and Co. Ltd., 51-55 Frith St, W.1.

Tong-type pig stunners—address for? L.W.M.—Iwel Engineering Co. Ltd., 7 Old Bailey, E.C.4.

Shaving sockets with companion isolating transformers for bathrooms—makers of? C.A.—Chilton Electric Products Ltd., Hungerford, Berks; Walsall Conduits Ltd., Excelsior Wks, West Bromwich, Staffs; Kentish Electrical Co. Ltd., 112 Albany St, N.W.1.

"Slick" lamp lacquers—makers of? T.E.—Slick Brands Ltd., Stafford Rd, Croydon, Surrey.

renewal in Selborne Primary and Secondary School, Conway Cres, Greenford. Borough Engineer, Town Hall. Deposit £1. N.I.C. firms only.—Advertised in this issue.

28 Dec.—Pontypool U.D.C. Provision, installation and bringing into service of 450 200 W sodium lamps/lanterns/steel columns, together with cabling. Engineer and Surveyor, Municipal Offices. Deposit £5 5s.

29 Dec.—Camberwell B.C. Supply of (List K) lamps and (S) fittings, cables and conduit. Borough Surveyor, Town Hall, S.E.5.

30 Dec.—Romford B.C. Supply of (List M26) lamps. Borough Engineer, Town Hall. Foolscap s.a.e. required.

10 Jan.—Southport C.B.C. Sub-contract 3. Electrical installation in Canning Rd Bus Depot extension.—See 23 Nov. issue.

15 Jan.—Bermondsey B.C. Supply of lamps for year from 1 April, 1962. Town Clerk, Spa Rd, S.E.16.

5 June—Campbeltown. N.A.T.O. Infrastructure contract, value £50,000, including flameproof gear for P.O.L. storage depot for power distribution and control, exterior lighting, installations including lighting in buildings, pipeline heating, earthing and bonding.—Advertised 23 Nov. issue.

No date stated—Ross and Cromarty C.C. (b) Electrical work in Arthurville Hse, Tain. —See 16 Nov. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

7 Dec.—Pakistan. Three ten-person passenger lifts. Director of Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/35753/61).*

8 Dec.—America. Two power c.b's. Bureau of Reclamation. Bldg 53, Denver Federal Center. B.o.T. (ESB/35734/61).*

11 Dec.—Burma. Nine-inch diameter industrial lighting reflectors and 500 W floodlights. Director-General, Union of Burma Purchase Board. St. John's Rd, Rangoon. B.o.T. (ESB/35763/61).*

12 Dec.—Formosa. Voltmeters, ammeters and wattmeters. Central Trust of China, Purchasing Dept., 68 Yen Ping Rd, Taipei. B.o.T. (ESB/35484/61).*

12 Dec.—Singapore. 200 Group "A" street lighting lanterns. Singapore City Council, Electricity Dept. B.o.T. (ESB/35705/61).*

13 Dec.—Pakistan. Current transformer, ammeter, voltmeter, resistances, etc. (11 items), for W.A.P.D.A. R. E. B. Willcox and Co., 36 Gt. St. Helens, E.C.3, are agents.

15 Dec.—France. Lamps, including mercury vapour, fluorescent tubes and starters (five items). Purchasing and Contracting Officer, H.Q., Allied Forces Central Europe, Camp Guynemar, Fontainebleau, S. and M., France. B.o.T. (ESB/36079/61).*

15 Dec.—Pakistan. Transmission and distribution equipment for East Pakistan W.A.P.D.A. Details from S. J. Shah and Co., 58 Thames St, Sunbury-on-Thames. Documents fee 12s by crossed P.O., made payable to S. J. Shah and Co.

17 Dec.—Iraq. Poles and street lighting fittings for Magil area. Purchase and Tender Office, Iraqi Ports Administration, Basrah. B.o.T. (ESB/35489/61).*

18 Dec.—India. Aircraft plugs, sockets and electrical accessories. C.D.N. Branch, India Store Dept., Government Bldg, Bromyard Ave, W.3. Document fee 10s, reference 16070/61/BMB/HAL.3.

20 Dec.—Greece. Elevators and 100 kW generator included in N.A.T.O. contract, value £49,000. N.A.T.O. Common Infrastructure Wks, Section of the General Hellenic Naval Staff, 2 Paparrigopoulou St, Athens. B.o.T. G.D.1316/60(36).*

22 Dec.—Singapore. 11,000 200 W 30 V sealed beam locomotive headlamps. Chairman, Tender Board, S.A. Railways, P.O. Box 7784, Johannesburg. B.o.T. (ESB/35795/61).*

27 Dec.—Portuguese East Africa. Electrical equipment. Ports, Railways and Transport Dept., Lourenco Marques. B.o.T. (ESB/36092/61).*

2 Jan.—Costa Rica. Transmission line between Atenas and San Mateo. Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/35780/61).*

2 Jan.—India. Tender inquiry HCP/SVHEP-8/Oct., 1961. 250 V 1,000 Ah station batteries for Shavavathi Generating Station and Shimoga and Bangalore receiving stations. Co-ordination Branch, India Store Dept., Bromyard Ave, W.3. Documents fee £3 15s. Viewing reference S.3572/61/NSC/ENG.2.

3 Jan.—India. Cable plastics insulated s.t.a. Purchase Officer: R. Prasad, Fertiliser Corpn. of India Ltd., Prabhu Kunj, Peddar Rd, Bombay 26. B.o.T. (ESB/36084/61).*

16 Jan.—Australia. Three 60 MW turbo-alternators. Chief Engineer, Southern Electric Authority of Queensland, Boundary St, Brisbane. B.o.T. (ESB/35182/61).*

19 Jan.—Australia. Two outdoor earthing resistors for use on a 33 kV system. Town Clerk, City Hall, Brisbane. B.o.T. (ESB/35459/61).*

19 Jan.—Colombia. Two transformer stations, motor pumps, o/h travelling cranes and two auxiliary generating sets for Ponedera-Candelaria (Dept. of Atlantico) irrigation project. Caja de Credito Agrario, carrera 8 No. 15-43, Bogota. B.o.T. (ESB/35445/61).*

15 Feb.—India. Generating plant and indoor switchgear for Sholayar I and Sarkarpatty power stations of Parambikulam H.E. Scheme. Superintending Engineer (Technical Electrical), Madras S.E.B., 157 Mount Rd, Madras 2. B.o.T. (ESB/35785/61).*

7 March.—Egypt. Six 200 ton per hr, 84 kgs per sq cm for 500°C boilers; three 60 MW turbo-generators; transformers, switchgear, instruments, Cairo Electricity and Gas Adminsitration, 53 Sharia July 26, Cairo. B.o.T. (ESB/34603/61).*

CONTRACTS PLACED

Alfreton U.D.C. Supply and erection of 179 Group "A" columns/lanterns/gear at Riddings, Golden Valley and Somercotes, Abacus Municipal Ltd.

Blackpool C.B.C. 13,200 Neoprene festoon strip lighting lampholders, D.R. Illuminations Ltd., £2,886. Recommended.

B.R. (N.E. Region). Transformer in control tower substation, Denis Ferranti and Co.; yard lighting in Tyne marshalling yard at Lamesley, K.S. Construction Co.

Chester C.B.C. Supply and installation of switchgear at Sealand Rd Sewage Disposal Wks, Brookhirst-Igranic, £3,990. Recommended.

Hendon B.C. Electrical installation in Copthall playing fields sports pavilion, Holliday, Hall and Stinson Ltd., £1,578.

Kirkby-in-Ashfield U.D.C. Supply and erection of 22 Group "A" columns/lanterns/gear, Abacus Municipal Ltd.

L.C.C. Supply and erection of 155 steel columns for floodlighting 19 schools, Abacus Municipal Ltd.

Stretford B.C. Electrical installations in 22 houses at Nansen Cl, T. and A. Nixon Ltd., £1,703. Recommended.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Chiltern Electrics Ltd. Creditors to send details to liquidator: G. A. Wale, Walter Hse, 418-422 Strand, W.C.2, by 15 Dec.

Matthews and Wright Ltd. Creditors to send details to liquidator: R. W. Hellyer, Brotherton Hse, Westgate, Leeds 1, by 8 Dec.

Rateliff (Electric) Ltd. Mr P. Cardwell, 93 Queen St, Sheffield 1, appointed liquidator at extraordinary general meeting on 16 Nov. for the purpose of voluntarily winding-up.

P. N. Burns (Tipton) Ltd. Mr D. J. Parkes, "Forstal Cottage," Margate Rd, Broomfield, Herne Bay, appointed liquidator at extraordinary general meeting on 15 Jan., 1960, for the purpose of winding-up.

Engelhard Hanovia Ltd. General meeting of members to be held at 52 High Holborn, W.C.1, on 20 Dec., for the purpose of receiving an account of the winding-up proceedings.

Lee Guinness Ltd. Winding-up order dated 15 Nov.

Snelson's Electrical (M/cr) Ltd. Winding-up order dated 13 Nov.

Valcon Electrical Ltd. First meetings of creditors and of contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 6 Dec., at 3.30 and 4 p.m., respectively.

Voluntary Liquidation

Electric House (F.G.H.) Ltd., 929 Rochdale Rd, Harpurhey, Manchester 9, retailers of electrical appliances.

Hire purchase restrictions and the failure of the domestic appliance market were the reasons given by Mr F. G. Harding, director, for the voluntary winding-up of the above company at a meeting of creditors held recently in Manchester.

The statement of affairs showed liabilities amounting to £1,891 of which £1,120 was to trade creditors, £465 loans, and £306 to the Bank. Assets of a book value of £605 were estimated to realise £270. There was a contingent liability of £2,920 for hire purchase.

Mr L. H. Shipton, of Poppleton and Appleby, 31 Lloyd St, Manchester 2, was appointed liquidator.

Companies Winding-up

Davis Bros. (Electrical) Ltd., 1 Vernon Rd, Romford, electrical contractors.

The Official Receiver reported to the first meeting of creditors that there were liabilities of £3,284 and £1,454 assets. This company formed in 1952 specialised in factory work and experienced difficulties in 1960-1 with unofficial stoppages and requests for higher bonuses by their workpeople, which culminated in a strike which lasted three weeks.

The case was left with the Official Receiver as liquidator.

BANKRUPTCY ACTS

Release of Trustee

Bradford. D. Cornish, electrical engineer and contractor, carrying on business as Cornish and Graham at 6 and 8 Maperton Rd. Trustee: G. E. Rushton, 36 North Parade, Bradford 1, released as from 6 Nov.

First Meeting and Public Examination

Northampton. J. B. English, electrical engineer, carrying on business as W.M.S. (Corby), at 1 Harrogate Court, Corby. First meeting: 11 a.m., 1 Dec., at Official Receiver's Office, 15 Guildhall Rd, Northampton; and public examination: 10.30 a.m., 5 Jan., at County Hall, Northampton.

TRADE NOTES

New factory. Monarch Electric Ltd., the subsidiary of Birmingham Sound Reproducers Ltd., is understood to be negotiating for another Government advance factory in Derry, N. Ireland.

New factory. Gordon Miller Ltd. are to open a new factory at New Battle, Midlothian, but the head office will remain at Croydon, and production will continue at their Croydon factory.

Mexico imports. Mexico have now decreed that the following goods are subject to prior import licence: clothes washing machines weighing over 100 kg, and spin dryers.

Made in Canada ruling. For Customs purposes, the Canadian Department of National Revenue have declared that gas turbines and steam turbines for stationary land are designated "of a class or kind made in Canada."

Eire imports. The Irish authorities have fixed a quota of 100,000 for certain electric filament lamps to be imported in the period 1 Dec., 1961, to 30 Nov., 1962.

BUSINESS PROSPECTS

Antrim R.D.C. Tender: 113 houses, two shops, Mossley; McCarthy and Lilburn, 43 Scottish Provident Bldgs, Belfast 1, quantity surveyors.

Arbroath. B.C. propose 111 dwellings, Newbigging site; Burgh Architect, Hill St.

Ashford U.D.C. Tender: 121 dwellings, Beaver Green; Surveyor.

Ballycastle. N.I. Hospitals Authority propose new hospital to replace Dalriada Hospital.

Ballymoney. R.D.C. propose 50 houses, Castle St and Gate End.

Belfast. C.C. propose reinforcement of electricity distribution system, Carnmoney area; cost: £337,532.

Belper. Derbyshire C.C. propose old people's home, Ash Hse, Field La.

Billingham. U.D.C. propose three blocks of ten-storey flats, town centre; architects: Elder and Lester, Town Sq.

Birmingham C.C. Tender: 108 houses, Valley Farm estate, Beacon Hill, Rubery; City Architect.

Bishop Auckland. New factory covering 150,000 sq ft proposed near Tindale Cres for Shorko Ltd., 161 Fleet St, E.C.4.

Boston. R.D.C. propose electrical installations to pre-war houses costing £2,100.

Bournemouth. Proposed: supermarket, Poole Rd, for Metropolitan Estate and Property Co., Hanover Sq, W.1. Planned: offices, showrooms, stores, Ringwood Rd, for Scott and Scott Ltd., 91 Poole Rd, Westbourne.

Bramshot. Royal Aircraft Establishment, Farnborough, propose works extensions.

Carlisle. New offices and canteen, Durranthill industrial estate, proposed for Automatic Coal Cleaning Ltd.; architect: G. W. Danson, 54 Lowther St.

Chatham. Office block, New Rd, proposed by Northern Assurance Co. Ltd.,; architects: Peter Ednie and Ptnrs., 4 Gray's Inn Sq, W.C.1.

Chesterfield. E. Erdman and Co., 6 Grosvenor St, W.1, propose redevelopment of Burlington St and Church La, Parker's Row area. M.o.W. award £970,000 contract for new P.O. Accountant General's dept., West Bars, to M. J. Gleeson Ltd.

Cookstown (Tyrone). U.D.C. propose 40 dwellings, Windsor Cres, Monrush housing estate.

Cumbernauld D.C. Tender: 301 dwellings, Kildrum development area; Chief Architect, Cumbernauld Hse, Cumbernauld, Glasgow.

Denton. Salford R.C. Diocesan Trustees propose St. Thomas Moore secondary school; architects: Mather and Nutter, Canada Hse, 3 Chepstow St, Manchester 1.

Doncaster. John Todd's Trustees, Stockton-on-Tees, propose 300-400 dwellings, Sprotborough Pk.

East Retford B.C. Tender: Pumping station, Bolham La, and pumping station, Hallcroft, Rd; J. D. and D. M. Watson, 67 Tufton St, S.W.1.

Eccles. Proposed: sheet metal and fabrication works, Fielding St, for Heavy and Co. Ltd., Cawdor St Wks, Patricroft.

Edgware. N.W. Regional Hospital Board, Eastbourne Terr, W.2, propose extensions to Edgware General Hospital.

Ely U.D.C. Tender: 70 houses, Priors Court, West Fen Camp; Engineer.

Enfield. Proposed: factory/offices, Alexandra Rd, for Automatic (Nazeing) Ltd., of Alexandra Rd.

Essex. C.C. propose £92,748 hostel, County Gdns, Chelmsford, for Mid-Essex Technical College and School of Art.

Exeter. C. Webber and Co. Ltd., Bonhay Rd, propose factory; contractors: F. W. Davey Ltd., Exmouth.

Gillingham. £100,000 extensions to Novadel Chemical Wks, Pier Rd, proposed by Novadel Ltd.

Glasgow. Students' hostel, Crookston Rd, proposed by Scottish Chamber of Commerce; architects: F. Burnet, Bell and Ptnrs. 180 Hope St, C.2. J. P. Coia, 20 Park Circus, C.3, architect for proposed nine-storey hotel, Bath St/West Nile St, for Marten Development Co. Ltd. C.C. propose replacement of electrical plant, Brenachoil, Loch Katrine, to cost £1,120.

Grimsby. B.C. propose installation of lift in Claremount Old People's Home; cost: £2,500; Engineer.

Guildford. Scott, Brownrigg and Turner, 32 London Rd, architects for proposed £200,000 theatre for Yvonne Arnaud Theatre Trust.

Harlow New Town. W. and C. French, Buckhurst Hill, contractors for new Standard Telephones and Cables premises.

Hartlepool. Taylor and Evans, Elwick Rd, West Hartlepool, propose 42 houses, Hart Station.

Hastings. L. G. Hawkins Ltd., Drury La, propose factory extensions, Windmill Rd. Planned: factory, Hurrell Rd, for Rastex Ltd.; architects: R. T. Glenister and Ptnrs., 17 Havelock Rd.

Havant and Waterloo. U.D.C. propose £1 million extensions to sewage disposal works, Budd's Farm, Brockhampton.

Hendon. B.C. propose installation of lifts in old people's dwellings.

Huddersfield C.B.C. Tender: six-form entry county secondary school and swimming pool, Almondbury; Borough Architect.

Huntingdon and Godmanchester. F. B. Thackray and Co. Ltd., St. Peter's Hill, Huntingdon, contractors for B.C's 99 dwellings; cost: £220,236.

Jarrow. Arndale Property Trust, Bradford, propose £250,000 bowling alley with multi-storey car park.

Kingsclere and Whitechurch. R.D.C. propose 50 dwellings during 1962.

Leeds. C.C. propose old people's homes, Kirkstall and Greenside, Lower Wortley; total cost: £180,000.

London. Factory extensions, Burlington La, Chiswick, proposed by Chiswick Products Ltd.; architects: W. L. Twigg and M. W. Twigg, 30 Bouverie St, E.C.4. Factory proposed, Stirling Rd, W.3, for F. Townend and Co. Ltd., Acton; architects: A. S. Bryan, Whitestocks, Loudwater La, Rickmansworth. C.C. propose £640,550 extensions to Phillipa Fawcett Training College, Streatham, S.W. Nine-storey shops/offices, Cheapside, proposed; architects: K. Lindy, J. Hill and Ptnrs., 24 St. Mary Axe, E.C.3. Bernard Sunley Investment Trust (Management) Ltd., 25 Berkeley Sq, proposes £250,000 offices, car park, Newington Causeway. 14 shops proposed at Grove Pk Station, S.E.12; architects: H. A. Halpern and Assocs., 58 Cannon St, E.C.4. Trehearn, Norman, Preston and Ptnrs., 83 Kingsway, W.C.2, architects for proposed 29 shops, 97 flats, Park Rd, N.W. New hotel costing £1¼ million proposed for Grosvenor Sq; architects: Lewis Solomon, Kaye and Ptnrs., Thavies Inn Hse, Holborn Circus, E.C.1. Estates Property Investment Co. propose 28 luxury flats, Westleigh Ave, Putney, costing £150,000; architects: Andrews, Emmerson and Sherlock, 63 Dean St, W.1.

Londonderry. Ministry of Home Affairs propose new central police station, Strand Rd Hospital site.

Luton. Norwich Union Insurance Soc., Norwich, propose multi-storey shops and offices, Upper George St and Stuart St; architects: Fielden and Mawson, 71a The Close, Norwich.

Manchester. Regional Hospital Board, Cheetwood Rd, propose extensions and adaptations, Blackburn Royal Infirmary, cost: £650,000; and four-storey maternity unit, Hope Hospital, Salford, cost: £400,000. Central and District Properties, 12 Berkeley Sq, W.1, propose £8 million site redevelopment, Victoria St, St. Mary's Gate and Deansgate.

Merthyr Tydfil. B.C. propose 92 houses, Vicar's Field, Troedyhiw Village.

Middlesbrough. Ceres Investments Ltd. propose conversion of Regent Cinema, Parliament Rd, to shops; architects: S. J. Hill and Ptnrs., 2 Whitfield St, Gloucester.

Middlesex. C.C. propose £165,060 extensions to Hayes and Harlington Comprehensive School and £286,296 extensions at Hayes and Harlington Bulstrode schools.

Midlothian. T. Bowhill Gibson and Laing, Palmerston Pl, Edinburgh, architects for proposed 11-storey flats with ground-floor restaurant, Ratho, nr. Forth Rd Bridge.

Morpeth. Newcastle Regional Hospital Board, Benfield Rd, Newcastle, propose nurses' training centre, St. Mary's Hospital, Stannington.

Newcastle. Factory/offices/warehouse, Fisher St, proposed by Hindhaughs Ltd., Cloth Market; architect: C. S. Errington, 46 Grainger St. Stanley Miller Ltd., North St, contractors for school of agriculture for King's College. Regional Hospital Board propose maternity and gynaecology unit, Walkergate Hospital; Board architect, Benfield Rd.

N. Ireland. S. Tyrone Hospital Management Committee award £733,990 contract for 150-bed unit, Dungannon Hospital, to F. B. McKee Ltd., 9 Shore Rd, Belfast.

Northants. Blackwood Hodge Ltd. propose 55 dwellings, Collingtree Grange estate, Collingtree.

Nottingham. Crosland Filters Ltd., 2 Broadway, propose new factory and offices. 16-storey architecture and engineering building and three-storey science library, Clifton Boulevard, proposed by University of Nottingham.

Penrith. Old people's home, Musgrave St, proposed by U.D.C.

Portsmouth C.C. Tender: 178 dwellings, Prince George St; City Architect.

Reading. C.B.C. propose £230,000 Alfred Sutton secondary girls' school; Architect.

Ryton. John Moody Ltd. (builders), 53 Whagg La, Whickham, propose 30 houses, Woodside Rd.

South Shields. Advance factory for Estates Management Corp. on Simonside industrial estate being built by J. Cummings, Matamba Terr, Sunderland. Milton Swales Ltd., Imeary St. contractors for additions to Elsey and Gibbons Ltd. factory. C. Solomon, 30 St. Mary's Pl, Newcastle, architect for proposed works, Maxwell St, for Harlow Printing Wks Ltd. B.C. Tender: 107 dwellings, Reading Rd, Brinkburn estate; Engineer.

Standish. R.C. authorities plan convent for Sisters of Mercy of Notre Dame, Standish Wood La, on 19-acre site.

Stanley. R.D.C. propose 364 dwellings, West Shield Row; Surveyor, Council Offices.

Stockton. R. W. Bell and Co. Ltd., Mistletoe Rd, Newcastle, propose 40 houses, Darlington La.

Stoke-on-Trent. Birmingham Regional Hospital Board award £308,745 contract for operating theatre suite/accident unit and ward block, N. Staffs Royal Infirmary, to Seddon (Stoke) Ltd., Winnington La, Northwich.

Uttoxeter. U.D.C. propose open-air swimming pool and ancillary works, Oldfields Rd: Surveyor.

Wakefield. Leeds Regional Hospital Board propose regional burns hospital, Pinderfields Hospital, to cost £116,425.

Wallsend. Kendall and Cross, Ponteland, Northumberland, contractors for Thermal Syndicate Ltd. factory block.

Witham. Factory and ancillary buildings at cost of £310,000, planned for H. Baird and Sons Ltd. Architects: J. N. Aylwin, 17 Soho Sq, W.1.

Wolverhampton. B.C. proposes training centre for spastics, Oxley; Engineer. Birmingham Regional Hospital Board award £152,013 contract to Wilson Lovatt and Sons Ltd., Clarence St, for new operating theatres, Royal Hospital.

Woolwich. Gula Investments Ltd. propose office block, Buntin St and Hough St, to cost £600,000; quantity surveyors: A. E. Thornton-Firkin and Ptnrs., 17 Fitzhardinge St, W.1.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

R. L. Blakeborough and Sons Ltd. Heating, electrical and mechanical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Dorothy M. Graeme and Paul G. Graeme, 61 Fairview Ave, Gillingham, Kent.

Henry Brown (Electrical) Ltd., 20 Burton's Arcade, Leeds 1. Electrical retailers, etc. Nom. cap.: £1,000. Dirs.: Henry Brown and Celia Brown.

Cables and Components Ltd., 6 Laurence Pountney Hill, E.C.4. Nom. cap.: £100. Dirs.: Alan F. C. Harrow and Mrs Eileen Harrow.

Canford Services (Holdings) Ltd., Commerce Hse, 49 Finsbury Rd, N.22. Electrical and general engineers, etc. Nom. cap.: £100. Dirs.: Russell G. Cave, Mrs Lilian A. N. R. Cave and Owen D. Jolly.

Coil Slitting Ltd., 20 Fitzroy Sq, W.1. Mechanical, electrical and general engineers, etc. Nom. cap.: £1,000. Dirs.: Leslie J. Zamit and Sidney Langrish.

Coliga Electrics Ltd., 713 Imperial Hse, Kingsway, W.C.2. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Shirley Hart and Averill Hart.

Cosmic Signal Ltd., 6 Broad St Pl, E.C.2. Manufacturers of and dealers in electronic devices, etc. Nom. cap.: £10,000. Dirs.: to be appointed by subs. Subs.: David E. Moses and Doreen Tisman.

Electron Illuminated Signs Ltd., 77 Strafford Gates, Potters Bar, Middx. Nom. cap.: £100. Dirs.: Ronald J. Bagnell and Brian J. Brundell.

Electronic Instrumentation and Systems Engineering Co. Ltd., 35 Cromwell Gro, W.6. Nom. cap.: £600. Dirs.: Janusz A. Sadowski and Mrs Anna Zgorska.

Heatrod Elements Ltd., 120 St. George St, Norwich. Electrical engineers, etc. Nom. cap.: £100. Dirs.: not named. Subs.: Arthur D. Ashton and Raymond C. Frostick.

Subsidiary of Heatrae Ltd., formed to manufacture elements.

Industrial Power Installations (Newport and Cwmbran) Ltd., 106 Victoria St, Cwmbran, Mon. Nom. cap.: £500. Permanent dirs.: Reginald T. Rudd and Henry T. Brookes.

Inferation Sales Ltd. To carry on business of selling agents for Inferation (Holdings) Ltd. and any subsidiary or associated company, etc. Nom. cap.: £100. Dirs.: not named. Subs.: Basil R. Davies and Susan E. N. Davies, 19 Moorgate, E.C.2.

P. J. North Ltd., 23 Filey St, Sheffield 10. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £1,000. Dirs.: Philip J. North and Barbara North.

Park (Ultrasonic Graders) Ltd. Designers, manufacturers of and dealers in ultrasonic and electronic grading machines, weighing and measuring machines, etc. Nom. cap.: £2,000. Dirs.: not named. Subs.: Cranston G. Walton and Peter E. Creed, 35 King St, Luton, Beds.

Rand Radiators Ltd., Chancery Hse, Chancery La, W.C.2. Electricians, mechanical and central heating engineers, etc. Nom. cap.: £100. Dirs.: Sydney G. Rand and Gladys I. Wykeham Edwards.

Sabel-Deutsch Ltd., 9 Ormond Close, Boswell St, W.C.1. Manufacturers of and dealers in connectors, plugs, etc. Nom. cap.: £100. Dirs.: Brian Shaw and John Bishop.

Victrolec Ltd., 3 York St, Manchester. To acquire the goodwill and all or any of the other assets of Victrolec Ltd. (in liquidation). Plant and machinery manufacturers, etc. Nom. cap.: £5,000. Dirs.: John H. Metcalf, Michael I. C. MacDonald and John F. Veevers.

Universal Central Heating Ltd., 62 Fulham High St, S.W.6. Nom. cap.: £450. Dirs.: John E. Cullimore and Jacques L. P. Charpin.

To supply panel heater systems direct to the public.

CORRECTION

A. and M. Berry Ltd., of Provincial Bank Chmbrs, Tooting Broadway, S.W.17, inform us that they will be mainly concerned in electrical contracting and retailing, not as manufacturers and retailers of vacuum cleaners as reported last week.

MEETINGS TO NOTE

THURSDAY, 30 NOV.

I.E.E. (Measurement and Control). Symposium on Nuclear Electronics. In conjunction with British Nuclear Energy Conference, until 1 Dec. Savoy Pl, W.C.2.

CHELMSFORD ENGINEERING SOCIETY. "The Prospects for Capital Goods in East/West Trade," J. B. Scott. Social Hall, Cromptons. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (N. Midlands). "Numerical Controlled Machine Tools," R. C. Brewer. Ruston Club, Lincoln. 7.30 p.m.

FRIDAY, 1 DEC.

I.E.E. (Southern). "The Banana Tube Display System—A New Approach to the Display of Colour Television Pictures," P. Schagen. South Dorset Technical College, Weymouth. 6.30 p.m.

I.E.E. (N.E. Graduates and Students). "Radiation, Its Detection, Measurement and Use," B. Nugent. Grey Hall, King's College, Newcastle. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Fawley). "Applications of Transistors and Diodes," D. Osborne. Room 4a, Admin. Bldg, Esso Petroleum Co. Ltd. 5.45 p.m.

INSTITUTE OF PLASTICS (N. Western). "Plastics in Batteries," R. G. Robinson and R. L. Walker. Textile Institute, 10 Blackfriars St, Manchester 3. 6.45 p.m.

A.S.E.E. (Chester and District). Annual dinner-dance at Queens Hotel, City Rd. 8 p.m.

A.S.E.E (Liverpool and District). "Mechanics of the Human Body," R. G. Harrison. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

INSTITUTE OF FUEL (S. Wales). "Fuel and Motive Power Problems of Railways," S. Ell. S. Wales Institute of Engineers, Park Pl, Cardiff. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Midlands). "Electronic Telephone Exchanges," J. F. Hesketh. N. Gloucestershire Technical College, Cheltenham. 7 p.m.

SATURDAY, 2 DEC.

A.S.E.E. (Oxford and Districts). Annual dinner at The Red Lion, Kidlington.

MONDAY, 4 DEC.

I.E.E. (Electronics and Communications). Discussion: "Backward Waves in Waveguides." Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Mersey and N. Wales). Lecture on "Simulation of Intelligence," D. M. MacKay. Royal Institution, Liverpool. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "Planning and Installation of the Sound Broadcasting Headquarters for the B.B.C.'s Overseas and European Services," F. Axon and O. H. Barron. College of Technology, Northumberland Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Precision Measurement," G. H. Rayner and A. Felton. Royal College of Science and Technology, Glasgow. 6 p.m.

I.E.E. (S. Midlands). "The Banana Tube Display System—A New Approach to the Display of Colour Television Pictures," P. Schagen. (Combined meeting with Supply and Utilisation Group, Electronics and Measurement Group and Birmingham Centre of Institution of Post Office Electrical Engineers.) College of Technology, Birmingham. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Applied Mechanics, Theory of Materials of Construction Group). Discussion: "Can Plastics Components Be Designed Rationally?" 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

E.P.E.A. (London Technical Group). "D.C. Transmission," T. E. Calverley. Tudor Room, Caxton Hall, S.W.1. 6.30 p.m.

R.S.A. Cantor Lecture: "Overseas Marketing," R. Falk. John Adam St, Adelphi, W.C.2. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Yorkshire). "Problems of Flow Measurement," H. E. Farrer. The University, Dept. of Fuel Technology, Mappin St, Sheffield. 7 p.m.

N.E. ELECTRICAL CLUB. "Sheik's Delight" (Lighting a Palace in Kuwait), R. W. Shaw. County Hotel, Neville St, Newcastle. 6.30 p.m.

ROYAL SMITHFIELD AND AGRICULTURAL MACHINERY SHOW at Earls Court until 8 Dec.

A.S.E.E. (Bolton). "Recent Developments in Semiconductors" A. Bulman. Railway Hotel, Trinity St. 7.45 p.m.

A.S.E.E. (Halifax). "A Complete Lighting Scheme," K. F. Haylor. Griffin Hotel, George St. 7.45 p.m.

A.S.E.E. (Leeds). "The Manufacture of Whisky." Gt. Northern Hotel. 7.30 p.m.

A.S.E.E. (Oxford and Districts). "Electronic Control in Industry." Reactor School, A.E.R.E., Harwell. 7.30 p.m.

A.S.E.E. (Sheffield). "The Nature of Lightning and Its Effects," K. Walton. Royal Victoria Hotel. 7.30 p.m.

A.S.E.E. (South Essex). "The Highfield Shield," D. H. Taylor. The Angel Hotel, Ilford Broadway. 8.15 p.m.

TUESDAY, 5 DEC.

I.E.E. (Measurement and Control). "Domains and Domain Patterns," Prof L. F. Bates. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Anglian). "The Design and Performance of High- and Low-Voltage Terminal Boxes," K. K. Schwarz. Assembly Hse, Norwich. 7.30 p.m.

I.E.E. (N.E.). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Workington College of Further Education. 7 p.m.

I.E.E. (N. Midlands). "The Potentialities of Artificial Earth Satellites for Radiocommunication," W. J. Bray. Bradford Institute of Technology. 6.30 p.m.

I.E.E. (N.W. Utilisation Group). "Recent Development in the Specification, Performance and Design of Contactor Control Gear," R. A. F. Craven. Engineers' Club, Albert Sq, Manchester 2. 6.15 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Precision Measurement," G. H. Rayner and A. Felton. Carlton Hotel, Edinburgh. 7 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Dynaspede. 823,504. Class 7. Couplings and clutches for machines. Heenan and Froude Ltd., Worcester Eng. Wks, Shrub Hill Rd, Worcester.

Electro-Piccolo. B817,321. Class 9. Electrotechnical apparatus, etc. Albert Stulz, Niendorf 1, Holsteiner Chaussee 283, Hamburg, Germany.

Mason Master. 820,586. Class 7. Power operated portable holders for drills, etc. John M. Perkins and Smith Ltd., London Rd Wks, Braunston, nr. Rugby.

Philips. 819,684. Class 11. Heating apparatus, etc. Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2.

Pyrotubes. B819,300. Class 11. Tubular heating elements. Metals Research Ltd., 91 King St, Cambridge.

Robinair. 810,926. Class 8. Refrigerators, washing machines, cookers, etc. Robinair Manufacturing Corpn., Montpelier, Ohio, U.S.A.

Sanfire. 821,322. Class 11. Incinerators. General Electric Co. Ltd., Magnet Hse, Kingsway, W.C.2.

Star Boy in design. 812,074. Class 7. Washing, polishing, cleaning and mixing machines, etc. Electrostar G.m.b.H., Reichenbach, Wurttemberg, Germany.

Telapproach. B812,231. Class 9. Apparatus, etc. American District Telegraph Co., 155 Sixth Ave, New York, N.Y., U.S.A.

Timex. 803,352. Class 14. Watches and electric clocks. U.S. Time Corpn., Middlebury, Connecticut, U.S.A.

Unicon. 802,493. Class 9. Economisers, etc. E. Green and Son Ltd., Economiser Wks, Calder Vale Rd, Wakefield.

THE INSTITUTION OF CIVIL ENGINEERS. "The Wales Empire Pool, Cardiff," E. C. Roberts and J. R. Kell. Great George St, Westminster, S.W.1. 5.30 p.m.

INSTITUTION OF PLANT ENGINEERS (London). "The Fuel Cell," F. T. Bacon. Royal Society of Arts, John Adam St, W.C.2. 7 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (N. Midlands). "Non-destructive Testing and Production Engineering," J. F. Hinsley. Joint meeting with Peterborough Branch of Incorporated Plant Engineers. F. Perkins Ltd., Conference Room, Peterscourt. 7.30 p.m.

A.S.E.E. (Nottingham). "Recent Developments in the Soviet Union," Dr D. F. Galloway. People's College of Further Education, Castle Rd. 7.30 p.m.

A.S.E.E. (Reading and Districts). "Small-bore Heating," B. Raynor. Caversham Social Club, Caversham. 7.30 p.m.

A.S.E.E. (S.E. London). "Radiovisor Parent Ltd.," G. A. G. Ive. Eltham Green School, Queenscroft Rd, S.E.9. 7.45 p.m.

A.S.E.E. (W. London). "Fault Consideration on Distribution Systems and Installations," J. H. Duncan. The White Hart, 49 King's Rd, S.W.3. 7.45 p.m.

WEDNESDAY, 6 DEC.

I.E.E. (Education Discussion Circle). Discussion: "Teaching Protective Systems." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N.W. Electronics and Communications). "Generation and Amplification in the Millimetre Wave Field," W. E. Willshaw. Engineers' Club, Albert Sq, Manchester 2. 6.15 p.m.

I.E.E. (Southern). "The Protection of High Voltage Insulators from Power Arc Damage," A. E. Guile. S.E.E.B. Offices, 10 Queen's Gdns, Hove, Brighton. 6.30 p.m.

I.E.E. (Tees-side). "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. Cleveland Scientific and Technical Institution, Middlesbrough. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Lubrication and Wear Group). "Lubrication Oil Filter Testing," K. E. Buckman and S. W. Kemp, and "A Standard Contaminant for Oil Filter Testing," A. T. Weare. 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

INSTITUTION OF PLANT ENGINEERS (Leicester). "Silicones in Engineering Applications," G. B. Ingram. Grand Hotel, Leicester. 7.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Education Group). "The Science Masters Association Syllabus," E. W. Tapper. 47 Belgrave Sq, S.W.1. 5.30 p.m.

I.E.S. (Newcastle upon Tyne Centre). "The Use of Coloured Light," J. W. Bessant. Joint meeting with the North East Electric Club. Room B7, The Percy Bldg, King's College, Queen Victoria Rd, Newcastle upon Tyne 1. 6.15 p.m.

A.S.E.E. (N. London). "Space Flight," Dr N. H. Langton. Wood Green Civic Centre, N.22. 8 p.m.

A.S.E.E. (Manchester). Joint lecture with the Students' Union at Openshaw Technical College, Whitworth St, Openshaw. 7.30 p.m.

A.S.E.E. (Portsmouth and District). "Heat Pumps," Miss M. V. Griffith. R.A.F.A. Club, Cosham 7.30 p.m.

A.S.E.E. (Preston). "Electrical Insulating Tapes —Techniques and Applications," E. J. M. Rosenthal. Farmers' Arms Hotel, Market St. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Computer and Medical Electronics Group). Discussion: "Possible Uses of Computers in Medical Diagnosis." London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (E. Midlands). "Transistors and Computers and Control Equipment," P. James. University of Leicester. 6.45 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Wales). "Microwave Valves," R. W. White. Glamorgan College of Technology, Treforest. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (W. Midlands). Symposium: "New Electronic Techniques in Non-destructive Testing." Wolverhampton College of Technology.

THURSDAY, 7 DEC.

I.E.E. Parsons Memorial Lecture: "Magnetohydrodynamics," Prof M. W. Thring. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Midlands). Discussion: "Semiconductors for Light Current Engineering." E.M.E.B. Showrooms, 191 High St, Lincoln. 7.30 p.m.

I.E.E. (N. Midlands). "Electricity in the Chemical Industry," P. McDermot Lecture Theatre, Y.E.B. Offices, Ferensway, Hull. 6.30 p.m.

I.E.E. (Maidstone). "Electronics in the Postal Mail Services," G. P. Copping. "Wig and Gown," Maidstone. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Steam Plant Group). Discussion: "Small Industrial Steam Plant." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

INSTITUTION OF PLANT ENGINEERS (Birmingham). "Electronic Control in Industry with Particular Reference to Automation." Hotel Leofric, Coventry. 7.30 p.m.

I.E.S. (Cardiff). "Visual Problems of Motorways," J. M. Waldram. Bowchier Hall, Cardiff.

I.E.S. (Manchester Centre). "Fundamental Principles of Street Lighting," C. S. Bayliffe. Demonstration Theatre, N.W.E.B., Town Hall Extension, Manchester 2. 6 p.m.

I.E.S. (Nottingham Centre). "The New I.E.S. Code," A. Roberts. Electricity Centre, Carrington St. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Tees-side). "Electronic Controllers," A. H. Isaac. Cleveland Scientific and Technical Institution, Middlesbrough. 7.30 p.m.

INSTITUTE OF FUEL (Midlands). "The Benson Boiler," W. P. C. Ungoed. Birmingham Exchange and Eng. Centre, Stephenson Pl. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (N.W.). "Radar for Civil Aviation Purposes," K. F. Slater. Reynolds Hall, Manchester College of Science and Technology. 7 p.m.

A.S.E.E. (S.W. London). "Floor-warming," J. E. Cook; "Electrical Contractors," E. C. Story. Prince of Wales Hotel, S.W.19. 8 p.m.

A.S.E.E. (Brighton, Hove and District). "Engineering in a Sugar Refinery," J. A. Pearson. The Cricketers' Hotel, Black Lion St, Brighton 1. 7.30 p.m.

FRIDAY, 8 DEC.

I.E.E. (Medical Electronics Discussion Group). Discussion: "The Peltier, Hall and Seebeck Effects." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (Western). "Some Unusual Types of Electrical Machinery," Prof G. H. Rawcliffe. Gloucester Technical College. 7.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Electron Microscopy Group). "Electron Microscopy in Japan," T. Mulvey and Dr M. Whelan. 47 Belgrave Sq, S.W.1. 2.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Applied Spectroscopy Group). Recent Development on X-ray Fluorescence Spectroscopy. Dr J. L. de Vries at the Royal Aeronautical Society. 2.30 p.m

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Non-destructive Testing Group). "The Correlation of Elastic Constants in Single Crystals and Polycrystals," Dr M. F. Markham. 47 Belgrave Sq, S.W.1. 6 p.m.

INSTITUTE OF PLASTICS (N. Western). Joint symposium with I.R.I. Manchester Section. Textile Institute, 10 Blackfriars St, Manchester 3. 6.45 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "Instruments in Clinical Chemistry," N. Crawford, and "Electronics in Surgery," R. Lightwood. Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

A.S.E.E. (S. Wales). Branch annual dinner at the Grand Hotel, Cardiff.

A.S.E.E. (Stoke and Crewe). "Estimating in Relation to Electrical Installation Contracts," W. H. Brooks. Royal Hotel, Crewe. 7.30 p.m.

MONDAY, 11 DEC.

I.E.E. (N.E.). "Progress in Oil-filled Cables and Their Accessories," A. N. Arman, F. J. Miranda and G. B. Bishop, and "The Influence of Ageing on the Characteristics of Oil-filled Cable Dielectric," P. Gazzana-Priaroggia, G. L. Palandrf and U. Pelagatti. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (London Graduates and Students). "Design of Service Equipment," B. W. Norman. Unit Cinema, 3 (Tels) Training Batt., R.E.M.E., Arborfield, Berks. 7 p.m.

I.E.E. (London Graduates and Students). Address by the President: "The Professional Engineer and an Expanding Industry," G. S. C. Lucas. Savoy Pl, W.C.2. 6.45 p.m.

I.E.E. (E. Anglian). "Co-operative Education in Engineering in the U.S.A.," R. L. Cannel. College of Arts and Technology, Cambridge. 6.30 p.m.

Sterling Cable Company Limited

HIGHER OUTPUT OFFSETS RISING COSTS

Mr James S. Clark on Satisfactory Current Order Book

THE 13th annual general meeting of Sterling Cable Company Limited was held on 24 November in London, MR JAMES S. CLARK (chairman and managing director) presiding.

The following is his circulated address: Ladies and Gentlemen, I have the pleasure to submit the Report of the Directors and Accounts of the Company for the year ended 31 March, 1961.

The Group profit, before tax, was £70,468, compared with £53,129 last year. Income Tax requires £29,855. The Group profit, after tax, is £40,613, out of which we have provided for Preference Share redemption £5,772, and for the Preference dividend, less tax, £6,112. The recommended Ordinary dividend of 7½ per cent., less tax, will require £18,605, leaving £10,124 to add to our carry forward, which now totals £79,014.

Profit Margins

Last year I told you of the healthy state of our Order Book—the exceptional range of types of cable for the Export and Home markets. As the year progressed it became apparent that the level of prices at which these orders were booked, although improved, still left much to be desired. A considerable portion of our business is taken at firm prices (except for metal variations), which means that all increases have to be absorbed by, and so decrease, the profit margin. There was a steady increase in operational costs throughout the year. Happily we were able to offset the full effect of these rising costs on our contracts by greater and more efficient output.

Our Order Book remains satisfactorily varied and adequate—output is at an all-time high. Profit margins are still below the 1958/59 level, modest as those margins were. We are optimistic that the results for the current year's trading will again show improvement.

Export Market

Export continues to be our main preoccupation, and is responsible for approximately half our output. We have been entrusted with the requirements of power, control, and instrumentation cables for many overseas projects of great size and complexity, and again it is our privilege to express our thanks to the Consultants and Contractors concerned for their continued splendid support. The enthusiasm of our staff and operators combined with the compactness and flexibility of our organisation makes it possible to solve the problems constantly met with in the Export market.

The cable industry has to move in front of the times. It must play its part in providing that vital necessity—cheap power. This means constant technical and practical development, the use of new materials requiring new plant and modern methods. Such developments cannot be realised unless there are reasonable profit margins stemming from stabilised trading conditions. Let us hope that goodwill and good sense will create and preserve these essential conditions.

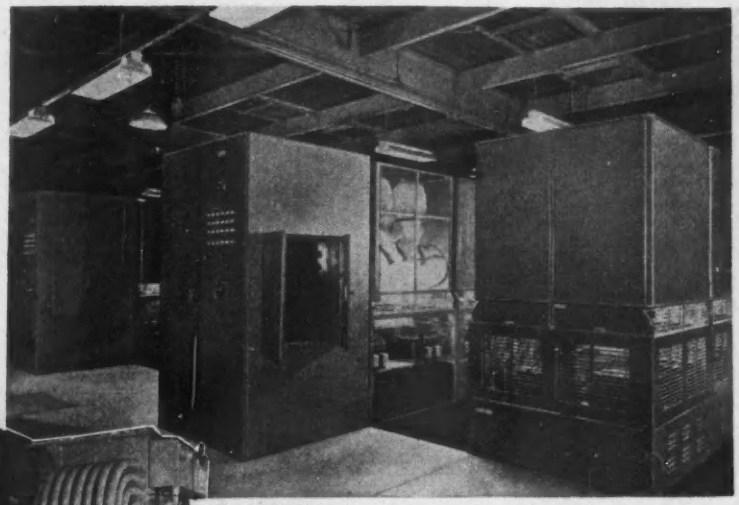
Our team has once again demonstrated both efficiency and goodwill, and I know you join with me in passing on our high regard and warm appreciation.

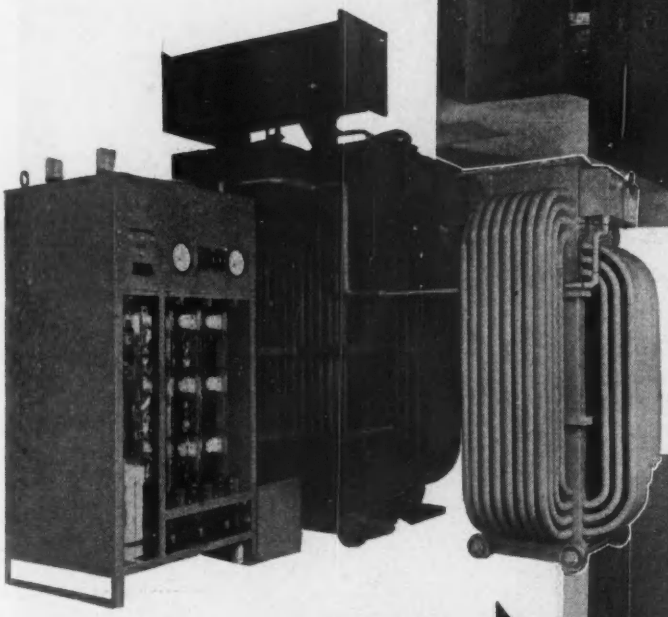
The report and accounts were adopted.

—RECTIFICATION—

MERCURY ARC

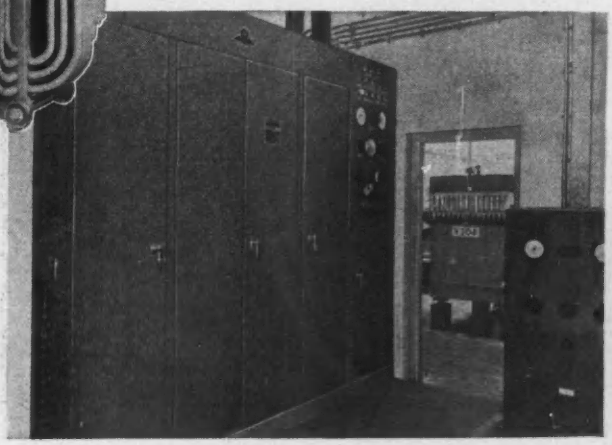
A Mercury Arc Rectifier installation at the works of Western Chemicals Ltd., Alberta, providing an output of 12,000 amps at 510 volts D.C. for electro-chemical duty.





SILICON

A 750 kW 3,000 amp forced air-cooled Silicon rectifier for electrolytic duty in Persia. A voltage regulator is included for voltage variation over the range 180/250 volts D.C.



GERMANIUM

A 6,000 amp water-cooled Germanium rectifier providing a continuous output at 100 volts D.C. for an electrochemical process at the Luton Works of Laporte Industries Ltd.

— MERCURY ARC OR SEMI-CONDUCTOR —

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HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd.
HERSHAM • WALTON-ON-THAMES • SURREY
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Manchester Glasgow Belfast Swansea

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

ABERGELE URBAN DISTRICT COUNCIL

Class "A" Street Lighting

TENDERS are invited for the installation of 176 140 W Sodium Vapour and 13 250 W colour-corrected Mercury Vapour Lighting Points in Water St, Dundonald Ave, Abergele; Marine Rd and Towyn Rd, Pensarn; Towyn Rd, Towyn; and Foryd Rd, Kinmel Bay; all forming part of A.548.

Specification, Bills of Quantities and Form of Tender may be obtained from and Plans inspected at the Office of the Engineer and Surveyor, Town Hall, Pentre Mawr, Abergele.

Tenders on the form supplied are to be delivered to the undersigned in the envelope provided NOT LATER THAN 12 NOON, on TUESDAY, 19 DEC., 1961.

The Council does not bind itself to accept the lowest or any Tender.

EDWARD J. LLOYD,
Clerk of the Council.

Town Hall,
Pentre Mawr,
Abergele.
20 Nov., 1961. (C 617)

BOROUGH OF EALING

Renewal of Electrical Installations at Selborne Primary and Secondary School, Conway Crescent, Greenford, Middlesex.

TENDERS are invited from approved N.I.C.E.C. contractors for the above-mentioned work. Specification and Tenders from the Borough Engineer, Town Hall, Ealing, W.5, on receipt of deposit of £1, returnable on receipt of a bona fide tender.

Closing date: 27 Dec., 1961.

E. J. COPE BROWN,
Town Clerk.
(C 616)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

GENERAL ASSISTANT ENGINEERS

(DRAWING OFFICE)

MECHANICAL

APPLICATIONS are invited for appointments as General Assistant Engineers (Drawing Office) Mechanical, in the Midlands Project Group's Drawing Office, at Bournville, Birmingham.

Candidates should possess a sound practical and technical training and be working towards a suitable professional qualification. The salary will be within either Scale 8, £920/£1,165; Scale 7, £840/£1,090; or Scale 5, £690/£940 per annum, in accordance with the National Joint Board Agreement.

Applications should be made on Form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 18 Dec., 1961.

Envelopes should be marked "Confidential—Staff Vacancy No. MPG.70 61." (C 642)

AIR MINISTRY WORKS DEPARTMENT

INVITES applications for positions as STATION ENGINEERS Grade II at R.A.F. and Ministry of Aviation establishments throughout the United Kingdom to supervise the installation, operation and maintenance of electrical and/or mechanical plant.

Salary, which is dependent upon age, quals. and exp., ranges in the U.K. from £801 (National Rate) at age 25 to £988 max. in Grade III.

Quals. and exp. Applicants, who must be natural-born British subjects up to age 35, should have served an apprenticeship and should hold an ONC of C. and G. Technical Cert. or Second Class M. of T. Cert. or equiv. Experience is required in one or more of the following:

Electrical Generation.
Electrical Distribution, H.T. and L.T.
Electrical Installations, Industrial and Domestic.
Light Current and/or Electronic Engineering.
Ventilation and Air Conditioning.
Heating and hot water supply.
Compressed gases and refrigeration.
Bulk fuel installation.
Diesel engine-driven plant.

Internal training courses provided and financial assistance and time off may be allowed for recognised courses of study leading to higher quals.

Prospects. Appointments are non-pensionable but retirement/resignation gratuity payable after five years' or more service. Excellent opportunities of obtaining permanent pensionable posts (with all service counting) and of advancement to the higher grades in which posts number 480 approx. Higher grade salaries vary between £988 and £1,747 p.a. (National Rate) and vacancies are, as a rule, filled by promotion of serving staff. Opportunities for overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. Five-day week with 26½ days' paid leave a year initially, including public holidays.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic Hse, Farringdon St, London E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised. (C 180)

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN

EASTBOURNE

SALARY: £600 x £25—£700 p.a. under N.J.C. Grade 1. Superannuable. Applicants should have had a good general education and experience in a distribution drawing office including the reproduction of ordnance maps, the preparation of plans and charts and the recording of mains on maps, etc.

Applications, quoting ET and naming two referees to District Manager, Seeboard, Electric Hse, Grove Rd, Eastbourne, by 13 Dec., 1961.

GEORGE WRAY,
Secretary.
(C 643)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER

(SYSTEM STANDARDISATION)

APPLICANTS should have had some experience in the installation and maintenance of domestic and small industrial electrical equipment, and in preparing estimates of the cost of this class of work.

The successful candidate will be employed in the Sub-Area System Standardisation Section of the Commercial Department.

Salary: N.J.B. Class N, Grade 13 (Scale 9), £1,115/£1,245 per annum.

DEMONSTRATOR (SHEFFIELD DISTRICT)

(TWO POSTS)

Applicants should have successfully undertaken a recognised course in domestic subjects and preferably possess the certificate of the Electrical Association for Women.

They must have experience in cooking practice, demonstration of electrical appliances, and be capable of advising consumers on the use of electricity in the home.

The successful candidate will have to give public demonstrations. She will normally be located in Sheffield, but may be required to work throughout the Sub-Area as occasion demands; in addition, she will be required to assist in the normal activities of the Service Centre as the need arises.

The normal hours of duty average 38 hours per week, Monday to Saturday inclusive, with one Saturday in four off duty.

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Change Alley, Sheffield, not later than 15 Dec., 1961.

No. 6 (Hull) Sub-Area

FOURTH ASSISTANT ENGINEER

(METERS, TESTING AND PROTECTION)

Applicants should have had a good general and technical education with some experience in the electrical industry subsequent to technical training.

The duties will include commissioning, testing, maintenance and repair of metering and protection equipment, fault location and general electrical testing throughout the Sub-Area.

The work is varied and interesting and offers opportunities of gaining valuable experience.

Salary: N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 6 (Hull) Sub-Area, Ferensway, Kingston upon Hull, not later than 15 Dec., 1961.

No. 1 (Bradford) Sub-Area

DEMONSTRATOR

Candidates should have had Domestic Science training, including Electrical Housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of Domestic Electrical Appliances and be able to give Demonstrations with a sales emphasis. The successful applicant will be located at Bradford, but may be required to work throughout the Sub-Area if the occasion demands.

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45-53 Sunbridge Rd, Bradford 1, not later than 15 Dec., 1961. (C 647)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER

DESIGN AND PLANNING SECTION

SUB-AREA ENGINEERING DEPARTMENT

MANCHESTER

THE duties will include the preparation of schemes and estimates for extension of a large city network and associated protective gear. Experience of the design and planning of systems up to 33 kV will be an advantage. Applicants should have received a technical education to H.N.C. level or its equivalent, and preferably have served a recognised engineering apprenticeship.

Salary Scale: £1,275/£1,410 p.a. Grade M.10. N.J.B. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 11 Dec., 1961. (C 636)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR ASSISTANT

(GENERAL ACCOUNTANCY)

SUB-AREA ACCOUNTANCY DEPARTMENT

BOLTON

THE duties will include organisation and methods, supervision of the Cashier's Section, including payment of invoices and the organisation and supervision of accounting and billing machines.

The possession of a professional accountancy qualification will be an advantage.

Salary Scale: £1,150 x £30—£1,240 p.a. Grade 6. N.J.C. Conditions

FOURTH ASSISTANT DISTRICT

COMMERCIAL ENGINEER

(TECHNICAL SALES AND SERVICE)

BURY DISTRICT

The successful applicant will be required to assist the Technical Sales and Service Engineer in connection with industrial and commercial tariff matters. The duties will include the preparation of space heating schemes and the giving of advice to consumers on the most efficient and economical utilisation of electricity. Technical qualifications to H.N.C. standard desirable.

Salary Scale: £765/£870 p.a. Grade H.13. N.J.B. Conditions.

DRAUGHTSMEN/DRAUGHTSWOMEN

(RECORDING)

BURY DISTRICT

Applicants should be capable of taking measurements on site whilst work on laying mains is in progress and be able to plot such mains on large scale ordnance maps, together with such technical information as may be required.

Salary Scale: £600 x £25—£700 p.a. Grade 1. N.J.C. Conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 16 Dec., 1961.

DRAUGHTSMAN/DRAUGHTSWOMAN

(RECORDING)

BOLTON DISTRICT

Applicants should be capable of entering mains records on ordnance sheets and making scale measurements.

Salary Scale: £225/£640 p.a. N.J.C. Conditions.

Applications to the Manager, at the address above, by 16 Dec., 1961.

FOURTH ASSISTANT ENGINEER

(SENIOR DRAUGHTSMAN)

SUB-AREA ENGINEERING DEPARTMENT

OLDHAM

Applicants should be experienced in the layout of 11 kV and 33 kV substations, substation design and protective gear diagrams as applied to high voltage switchgear and transformers.

continued in next column

continued from previous column

Salary Scale: £965/£1,090 p.a. Grade L.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, and returned to him by 16 Dec., 1961.

PRINCIPAL ASSISTANT

SUB-AREA SECRETARIAL DEPARTMENT

KENDAL

Applicants should be capable of assisting the Sub-Area Secretary in all aspects of the Department's work and be well acquainted with modern administrative methods and procedures.

Experience of personnel work, wayleave and property records and the administration of non-operational properties is desirable, and a knowledge of legal provisions affecting the industry. An appropriate professional qualification would be an advantage.

Salary Scale £1,380 x £40—£1,500 p.a. Grade 8. N.J.C. Conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, and returned to him by 16 Dec., 1961. (C 622)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

APPLICATIONS are invited from suitably qualified engineers for the following appointments in the Technical Branch of the Regional Electrical Department.

(1) ONE THIRD ASSISTANT ENGINEER

(PROTECTION)

Grade 8, Class K (£1,145/£1,410 per annum, based on Leeds (Design Section) to undertake the checking of schematic diagrams, wiring diagrams and specifications for protective and control gear and associated apparatus. Site commissioning experience would be an advantage.

(2) TWO FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 10 or 11, Class K (£980/£1,245 or £900/£1,165 per annum), based on Leeds (Design Section) to assist with the work described under Vacancy (1).

(3) THREE FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 11, Class K (£900/£1,165 per annum), based on North Tees, Leeds and Rotherham, to assist with testing and commissioning of generators, transformers, switchgear, lines and cables and with the testing, commissioning and maintenance of protective gear and control and indicating equipment for switchgear and transformers.

In all cases experience in a switchgear manufacturer's works would be an advantage.

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 15 Dec., 1961. (C 638)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER

REQUIRED in the Warrington District of the Board's No. 2 Sub-Area. Salary within range £1,190/£1,325 per annum (N.J.B. H.7, Scale 10).

Applicants must have received a sound engineering training and have experience in the construction and operation of overhead and underground distribution systems, including indoor and outdoor substation equipment. A technical qualification is desirable.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway Hse, Northwich, Cheshire. Closing date: 15 Dec., 1961. (C 634)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

STATION SHIFT CONTROL ENGINEERS

REQUIRED at Hams Hall "C" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment. Salary within Schedule A of the Agreement, Grade K.10, £1,115/£1,245 per annum, plus 10% for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 281/61 MR on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwickshire, to be completed and returned by 11 Dec., 1961. (C 628)

NORTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD

ELECTRICAL ENGINEERS

(MAIN GRADE)

SALARY: £950/£1,650. Applicants must be A.M.I.E.E. Graduate members eligible on scale up to £1,255.

ENGINEERING DRAUGHTSMEN

Three grades of appointment available according to experience with salaries ranging from £570/£1,300. Three years' practical and theoretical training required for lowest grade; H.N.C. for highest.

Starting salary for most posts depends on qualifications and experience. Superannuation Scheme. Mileage payments for use of car. Staff restaurant.

Applications giving age, qualifications, present salary and full details of experience, with dates and names and addresses of two referees, to the Secretary, North East Metropolitan Regional Hospital Board, 40 Eastbourne Terr, W.2, within 14 days. (C 626)

Eastern Electricity

Norfolk Sub-Area

KING'S LYNN AND WESTERN DISTRICT

SENIOR COMMERCIAL ASSISTANT

245/61.R.

THE position will call for the activities of a man with considerable experience in the successful organisation of a sales force operating in showrooms and outside as sales representatives. Ability and experience in the planning and operation of intensive integrated sales campaigns, exhibitions and demonstrations in addition to the operating of large and small showrooms is a necessary qualification. The development potential of the District is high, but the competition is also intensive and the position is therefore one of importance and challenge.

Salary: N.J.C. Grade 5, £1,020/£1,140 per annum. The commencing salary will be dependent on previous experience.

Apply by letter to the Manager, King's Lynn and Western District, Eastern Electricity, Gaywood Bridge, Wootton Rd, King's Lynn, Norfolk, by 8 Dec., 1961.

Northmet Sub-Area

GENERAL ASSISTANT ENGINEER

METER TESTING STATION

FRIERN BARNET RD, N.14

(Ref. 1094) 246/61.R.

Candidates should have a good general and technical education. A knowledge of the repair testing and commissioning of meters and metering equipment for domestic and industrial supplies will be an advantage.

Salary: N.J.B. Class N, Grade 16, £940/£1,065 per annum, including London Allowance.

Apply by letter to the Manager, Eastern Electricity, Northmet Sub-Area, Northmet Hse, Southgate, London N.14, by 15 Dec., 1961. (C 637)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

THIRD ASSISTANT COMMERCIAL ENGINEER

(Ref. 66/61)

REQUIRED for the Falkirk District of this Area.

Candidates should have had a sound practical training in electrical engineering and be experienced in the work of a Commercial department of an electricity supply undertaking. The possession of a Higher National Certificate would be an advantage.

N.J.B. conditions. Salary: Class G, Grade 9, £965/£1,090 per annum. Superannuable post.

Applications, on the standard form obtainable from the Manager, South of Scotland Electricity Board, "Woodlands," St. Ninians Rd, Stirling, should be submitted not later than 13 Dec., 1961. (C 640)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Mid-Wales and North Monmouthshire District (Abergavenny) of the Monmouthshire and Mid-Wales Area.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class E, Grade 9, Scale 5, £825/£940 per annum.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to W. E. Richardson, M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon., to arrive not later than 16 Dec., 1961.

Please quote reference 145/61/ET, endorsing envelope "Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(C 641)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's North Western District at Lithos Rd, Hampstead, N.W.3.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, i.e., £1,090 per annum, rising to £1,215 per annum, inclusive of London Allowance.

Applications should be sent to the Manager, North Western District, Lithos Rd, Hampstead, N.W.3, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3453/T. (C 645)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 308/ET/61.

APPLICATIONS are invited for the appointment of:

MAINTENANCE ENGINEER (MECHANICAL)

at Uskmouth "A" Power Station, West Nash, nr. Newport, Mon.

Salary: Schedule A, Class K, Grade 5, Scale 14, £1,535/£1,720 per annum.

Applicants should have had mechanical maintenance experience in a large modern power station and should preferably be corporate members of the Institution of Mechanical Engineers or hold equivalent qualifications.

Special application forms are available from Establishments, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 16 Dec., 1961. (C 653)

LCC HAMMERSMITH DAY COLLEGE

50 BROOK GREEN, W.6

Tel. RIV 3618

EXPERIENCED tradesman required on four half-days per week (morning or afternoon) to instruct ELECTRICAL INSTALLATION apprentices and trainees in the theory and practice of the C.G.L.I. Course 51A Syllabus.

Payment will be at the rate of £3 7s 6d (at present under review) per half-day of 3½ hours. Apply to Principal, quoting FE 3a/E/3134/12). (C 644)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Wolverhampton Area

SECOND ASSISTANT DISTRICT ENGINEER

(CANNOCK)

Duties include the planning, construction, operation and maintenance of H.V. and M.V. mains and substations within the District, in which work applicants should preferably have had experience. Technical qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B. Grade F.7). Apply, by letter, within 14 days, stating age, experience present position and salary, to Mr D. Holt, Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Worcestershire Area

FOURTH ASSISTANT ENGINEER

(SHIFT CONTROL)

(CONTROL CENTRE, AREA OFFICE)

Duties will include assisting the Shift Engineer to carry out all functions associated with a high voltage system control. Applicants should have had technical training together with experience of switching operations and maintenance work on H.V. distribution equipment. Salary: £890/£1,015 per annum, plus 10% shift allowance (N.J.B. Grade K.13). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr R. Mallet, Area Manager, Midlands Electricity Board, P.O. Box 52, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(C 629)

COUNTY BOROUGH OF NEWPORT

MON.

BOROUGH ARCHITECT'S DEPT.

require an

ASSISTANT ELECTRICAL ENGINEER

Grade APT. III. £960/£1,140 per annum. A.M.I.E.E., Higher National Certificate or equivalent. Five-day week. Approved removal expenses paid. Further particulars and application forms from:

Borough Architect,
Civic Centre,
Newport, Mon.

(C 655)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (COMBUSTION)

REQUIRED at Coventry Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade G.7, £1,115/£1,245 per annum.

Applicants should be competent engineers and should have had good experience in the operating problems arising in power stations. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 287/61 MR on Form AE6, available from the Station Superintendent, Coventry Power Station, Aldermans Green, Coventry, to be completed and returned by 11 Dec., 1961. (C 654)

SEB

SENIOR ASSISTANT (INCOME)

(Z.1436)

SUB-AREA Accountant's Department of No. 2 (Newbury) Sub-Area. Salary: N.J.C. Grade 6 (£1,150/£1,240 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Principal Assistant, in the supervision and control of a large Electricity Accounts Billing Section. It is essential that the person appointed will be capable, after being given suitable training, of programming and supervising the operation of a small electronic computer.

ASSISTANT ENGINEER (PLANNING)

(Z.1424)

Melksham District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£965/£1,090 per annum). Present trends indicate that the District will be re-classified to Class H with effect from 1 April, 1962, salary £1,040/£1,165 per annum. N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

SHIFT ENGINEER

(Z.1417)

Melksham District of No. 2 (Newbury) Sub-Area, located at Hawthorn (Quarry) Site, Corsham. Salary: N.J.B. Class G, Grade 12 (£765/£870 per annum, plus a shift allowance at present £90 per annum). Present trends indicate that the District will be re-classified to Class H with effect from 1 April, 1962, salary £825/£940 per annum. N.J.B. Conditions of Service.

The duties of the post will include supervision of manual staff employed on the maintenance of H.V. and L.V. networks and plant, and to be responsible to the senior engineer for the operation and control of such networks and plant.

GENERAL ASSISTANT ENGINEER

(Z.1444)

Newbury District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class G, Grades 14 and 13 (£670/£805 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with distribution including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. Applicants should possess suitable technical qualifications.

Applications for these appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting the appropriate "Z" number, not later than 11 Dec., 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (C 648)

SHIFT CHARGE ENGINEERS

are required for the Power House serving the whole of the AEI Rugby Works with steam, electricity, compressed air and service water.

QUALIFICATIONS: Age 35-45. H.N.C. or B.O.T. certificate. Land or Marine operating experience of power plant essential. Previous shift work an advantage.

APPLY TO:

Technician Staff Manager (Ref. WM2),
Group Personnel Services,
Associated Electrical Industries (Rugby) Ltd.,
Rugby.

(C 657)

CENTRAL ELECTRICITY GENERATING BOARD
Western Division

ASSISTANT REACTOR PHYSICIST

required at Hinkley Point Nuclear Power Station, Bridgwater, Somerset.
W/AV/115/61.

Superannuation Scheme. Salary N.J.B. Class O. Grade 7, Scale 16, £1,795/£1,950 per annum.

The work associated with this appointment concerns the interpretation of measurements made on the reactors to ensure their safe and efficient operation. There will be some routine work, but the major task will be the anticipation and prevention of operational difficulties.

The successful candidate should preferably possess a degree in physics or mathematics and have a keen interest in the operational problems of nuclear power stations.

Adequate nuclear training will be given where necessary.

Good sick pay and holiday schemes are in operation.

Applications on Form AE6/ACT, obtainable from the Personnel Department, 26 Oakfield Rd, Bristol 8, should be completed and returned by Monday, 18 Dec., 1961.

(C 649)

OUTSIDE SALES ENGINEERS

Bruce Peebles and Co. Ltd., manufacturing electrical engineers, require Sales Engineers for their Manchester, Birmingham and Leeds offices.

Applicants must have served a recognised apprenticeship in electrical engineering, should be of Higher National Certificate standard technically, and have had inside sales experience. Preferred age group 25-35 years. The man for Birmingham office may be asked to live in the East Midlands region, and for Leeds office must live in or near Sheffield.

Housing assistance would be available in approved cases and a car would be provided.

Applications giving details of training and career should be made to:

Mr R. W. Flux, Director,
BRUCE PEEBLES AND CO. LTD.,
Edinburgh 5.

(C 650)

N.I.R.N.S. NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

have vacancies at the

RUTHERFORD HIGH ENERGY LABORATORY
Harwell, Berks.

ELECTRICAL DESIGN STAFF

are required for the development of circuits and the specification of plant and equipment associated with particle accelerators. The work covers a wide technical field and involves close liaison with scientific staff developing a variety of experimental apparatus. A sound basic training in electrical engineering is required but previous experience of nuclear work is not essential for these posts:—

ASSISTANT DESIGN ENGINEER

with good experience of electrical design work. A knowledge of modern techniques concerning control and instrumentation would be an advantage. A Higher National Certificate in electrical or electronic engineering is required. The starting salary will be in the scale £1,065/£1,535 according to age and experience with annual increments to the maximum of the scale.

DRAUGHTSMEN

to work in an electrical design office on detailed drawing and layouts of a general nature. An appropriate Ordinary National Certificate together with a few years workshop experience and some drawing office experience is required. The starting salary will be in the scale £650/£1,065 according to age and experience with annual increments to the maximum of the scale.

Opportunities occur for advancement to higher posts. There is a contributory superannuation scheme, transport facilities are available and assistance may be given with housing.

Please send a postcard for further details to:—

personnel officer:
RUTHERFORD HIGH ENERGY LABORATORY, HARWELL
quoting reference number VN92/49.

(C 632)

CROMPTON PARKINSON (CHELMSFORD) LIMITED

require a

SENIOR TEST ENGINEER

An experienced man, conversant with the testing of medium sizes a.c. and d.c. machines is required in our rotating machine test section. Applications should be sent in confidence to:

Personnel Officer,
Crompton Parkinson (Chelmsford) Ltd.,
Writtle Rd,
Chelmsford, Essex.

(C 566)

OPPORTUNITIES FOR CABLE ENGINEERS

(ELECTRICAL)

Vacancies exist at an expanding electrical cable factory in the London Area.

Applicants are required for posts in the development and engineering depts. Knowledge of cable designs an advantage. Minimum qualifications H.N.C. Salary commensurate with ability. Attractive superannuation scheme available.

Write full details, Box No. 8495, Electrical Times. (C 660)

NUCLEAR CHEMICAL PLANT LIMITED

require an

ELECTRICAL DRAUGHTSMAN

to assist in the preparation of drawings and specifications for power distribution, lighting, motor control, process heating and electrical control systems for novel chemical plant installations. The position would suit a young draughtsman who either holds or is progressing towards the National Certificate in Electrical Engineering and wishes to gain useful experience over a wide field of electrical applications.

Good salary and working conditions. Pension Scheme.

Apply, giving brief details to:

Nuclear Chemical Plant Ltd.,
105-113 The Broadway,
West Ealing, W.13.

(C 625)

E C C

INTERNAL PROMOTION CREATES VACANCIES

for

SENIOR SALES ENGINEERS

in

(a) Scotland (b) Newcastle upon Tyne area (c) Lancashire

for promoting sales of:—

ROTATING MACHINES, SWITCH AND CONTROL GEAR, RECTIFIERS AND TRANSFORMERS

Excellent prospects for the right applicant.

Apply in writing, giving full details of training and experience to:—

(a) The Manager,
Glasgow,
The Electric Construction Co. Ltd.,
'Bushbury House,'
5 Woodlands Terrace,
Glasgow C.3.

(b) The Manager,
Newcastle upon Tyne,
The Electric Construction Co. Ltd.,
Lloyds Bank Chambers,
Westgate Road,
Newcastle upon Tyne 4

(c) The Area Manager,
The Electric Construction Co. Ltd.,
'Bushbury House,'
435 Wilmslow Road,
Withington,
Manchester 20

(C 624)

CENTRAL ELECTRICITY GENERATING BOARD
SOUTHERN PROJECT GROUP
West Thurrock Power Station

Applications are invited for the post of THIRD ASSISTANT ENGINEER (PLANNING AND PROGRESS) at West Thurrock Power Station Construction Site.

Applicants should be familiar with the problems relating to the planning and progressing of power station construction and have sufficient knowledge of the detailed construction and erection of power station plant to enable preparation of programmes and to report on the progress of plant erection at site.

Membership or qualifications leading to membership of a professional institution will be an advantage.

The salary will be within Scale 13 of the National Joint Board Agreement, i.e., £1,320/£1,610 per annum, according to qualifications and experience, plus £60 per annum London Allowance.

Applications stating age, qualifications, experience, present position and salary, should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires La, Finchley, London N.3, to arrive not later than 11 Dec., 1961.

Envelopes should be marked "Confidential Ref.: S/61/28."

T. YULE,
Chief Project Engineer.

(C 619)

W. H. ALLEN, SONS & CO. LTD.

have a vacancy for a

SALES ESTIMATING AND CONTRACTS ENGINEER

in their

ELECTRICAL DEPARTMENT

Candidates should be between 24-35 years' old and possess at least an H.N.C. in Electrical Engineering or equivalent. The work will cover proposals involving A.C. and D.C. generators and motors, switchgear and control gear for Land and/or Marine applications. Salary according to experience and qualifications.

Application forms, etc., can be obtained from:

THE PERSONNEL MANAGER,
(Ref. 507/2/2)
Queen's Engineering Works,
Bedford.

(C 603)

"Belling"

DEVELOPMENT ENGINEER

The Company invites applications for the appointment of a Development Engineer at their works at Enfield, Middlesex.

Applicants should have wide experience in the development of Domestic Electric Heating and Cooking Appliances, with good technical qualifications. An appropriate salary will, of course, be paid.

Please address your letter with full details to:

MR C. R. BELLING, BELLING AND CO. LTD.,
BRIDGE WORKS, ENFIELD, MIDDLESEX.

(C 631)

BICC

require

ELECTRICAL ENGINEERS

(up to 35 years of age)

in possession of, or well advanced in studies for, H.N.C. and interested in high voltage problems associated with the development of super-tension a.c. and d.c. cables both paper and plastic insulated.

The H.V. laboratory is equipped with 3·2 MV impulse 800 kV a.c. and 750 kV d.c. facilities and also deals with investigations such as a.c. ionisation, thermal resistance and a.c. conductor resistance.

The Company offers good conditions of employment together with excellent long-term prospects.

Applications should be addressed to:

Works Personnel Officer,
BRITISH INSULATED CALLENDER'S CABLES LTD.
Crabtree Manorway,
Belvedere, Kent. (C 658)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

GENERAL ASSISTANT ENGINEER

(MECHANICAL MAINTENANCE)

Vacancy No. 246/61.

GENERAL ASSISTANT ENGINEER

(ELECTRICAL MAINTENANCE)

Vacancy No. 247/61.

STAYTHORPE "A" AND "B" POWER STATIONS

APPLICATIONS are invited for the above vacancies at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Preference will be given to candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825/940 per annum) of the National Joint Board Agreement, and the positions will be pensionable within the terms and conditions of the Electricity Supply Industry.

Closing date for receipt of applications: 5 Dec., 1961.

Applications, quoting appropriate Vacancy No., should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(C 651)

LONDON ELECTRICITY BOARD

DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Eastern District at 84 Romford Rd, Stratford, E.15.

Applicants preferably should be not less than 21 years of age and have had experience in mains recording work, be able to compile neat and accurate permanent records, and to undertake general duties appropriate to a District Drawing Office.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £600/£700 per annum, plus the appropriate London Area Allowance.

Applications should be sent to the Manager, at the above address, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3264/T. (C 646)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

KINGSTON POWER STATION

ASSISTANT ENGINEER (CONTROL)

Vacancy No. 285/61.

APPLICANTS should be interested in all aspects of station operation, and opportunity will be given for experience of higher grade duties.

Salary: N.J.B. Class G, Grade 13, £845/£935 per annum, including London and Shift Allowances.

Applications giving age, details of experience, etc., should be sent to the Station Superintendent, Kingston Power Station, Downhall Rd, Kingston upon Thames, Surrey, to arrive by 7 Dec. (C 652)

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical and Public Lighting Section

APPLICATIONS are invited for the following posts:

(a) ELECTRICAL ENGINEER

Grade A.P.T. IV (£1,140/£1,310 p.a.)

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continued in next column

continued from previous column

experience), or hold the Higher National Certificate in Electrical Engineering (with five years' experience). They should have considerable experience in lighting engineering, particularly public lighting.

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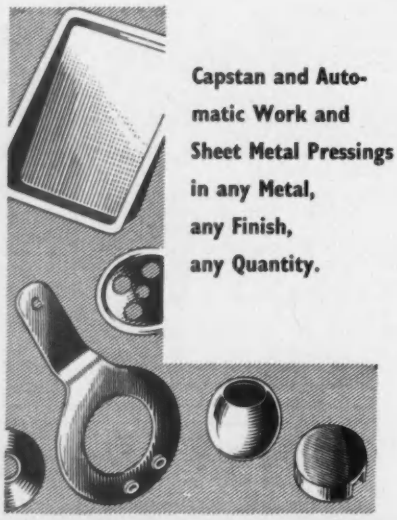

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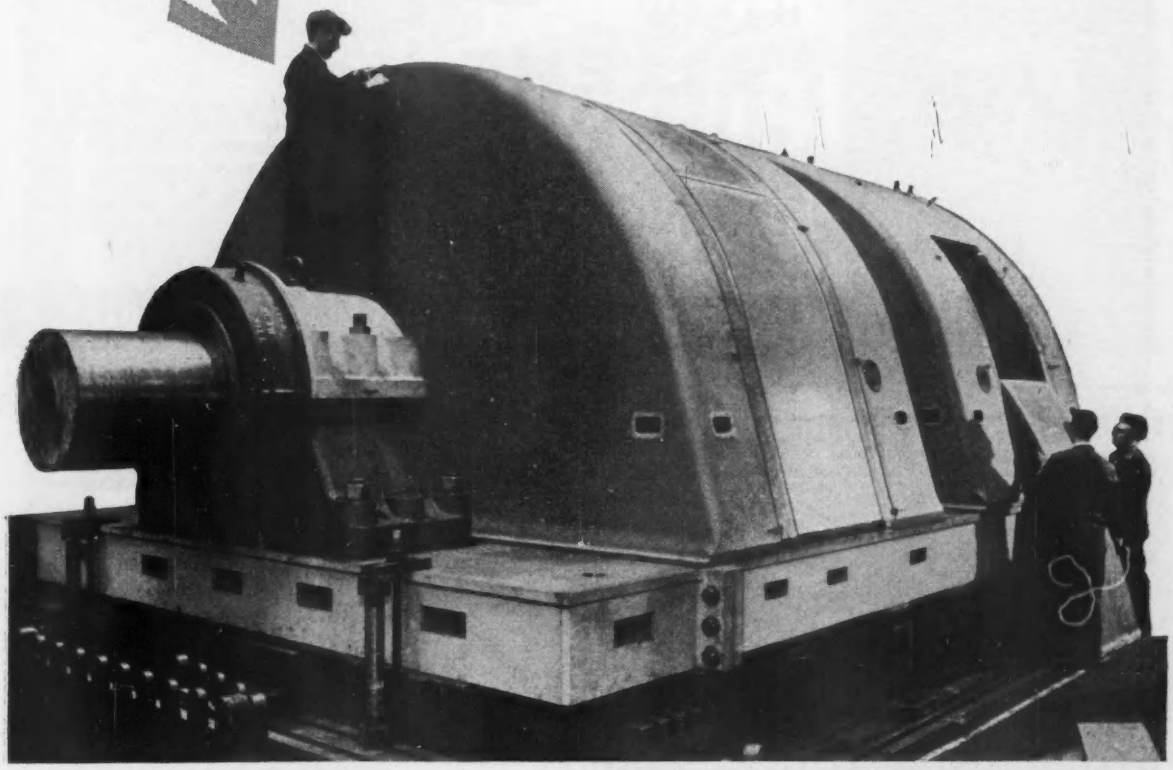

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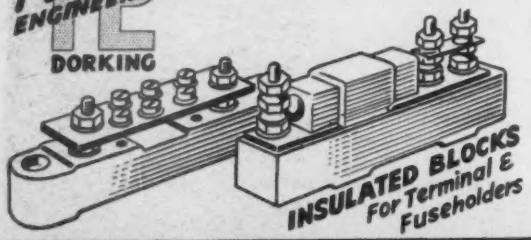

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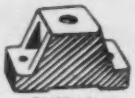
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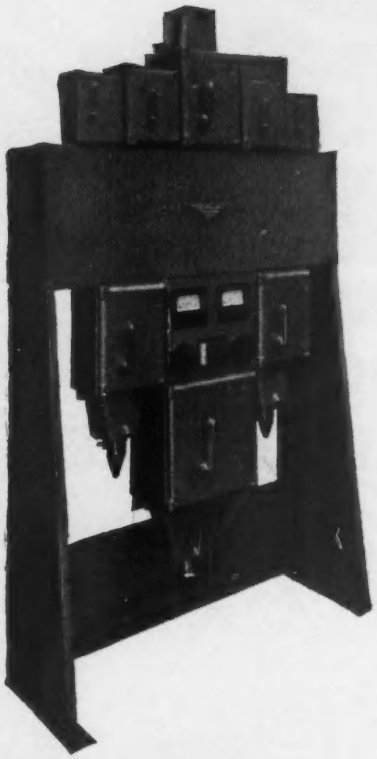

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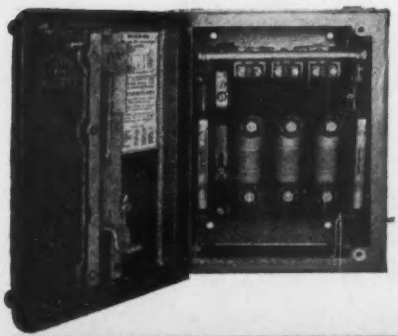

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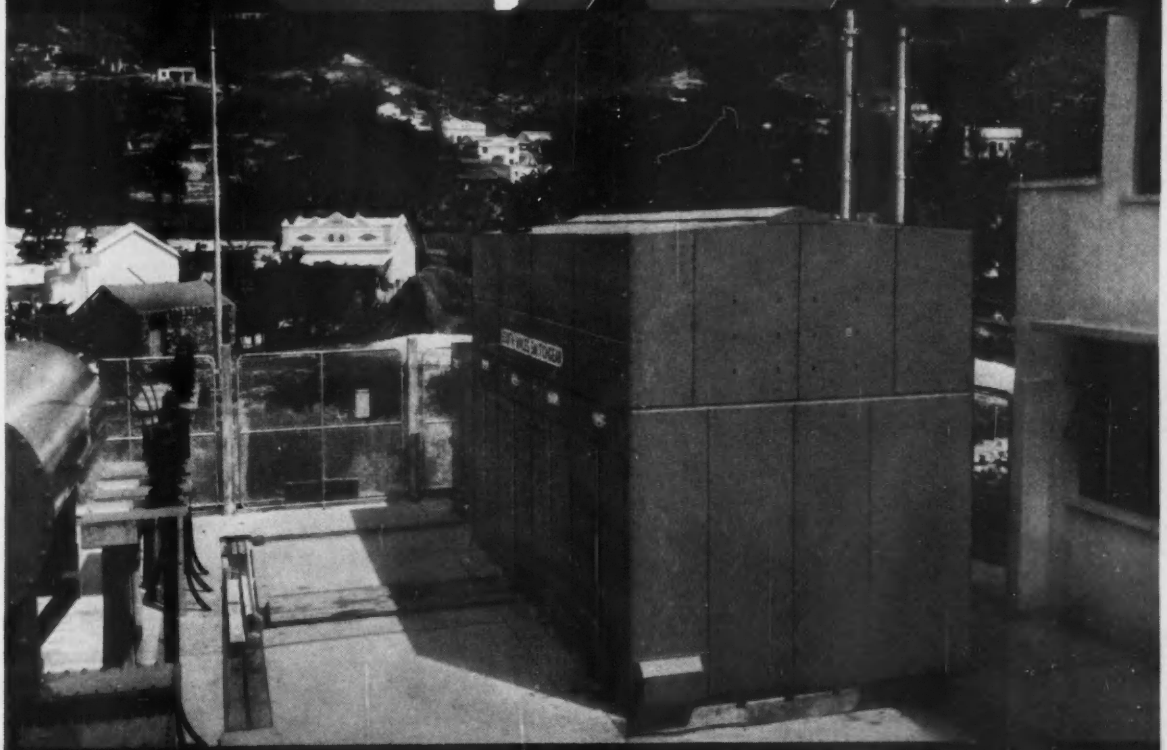

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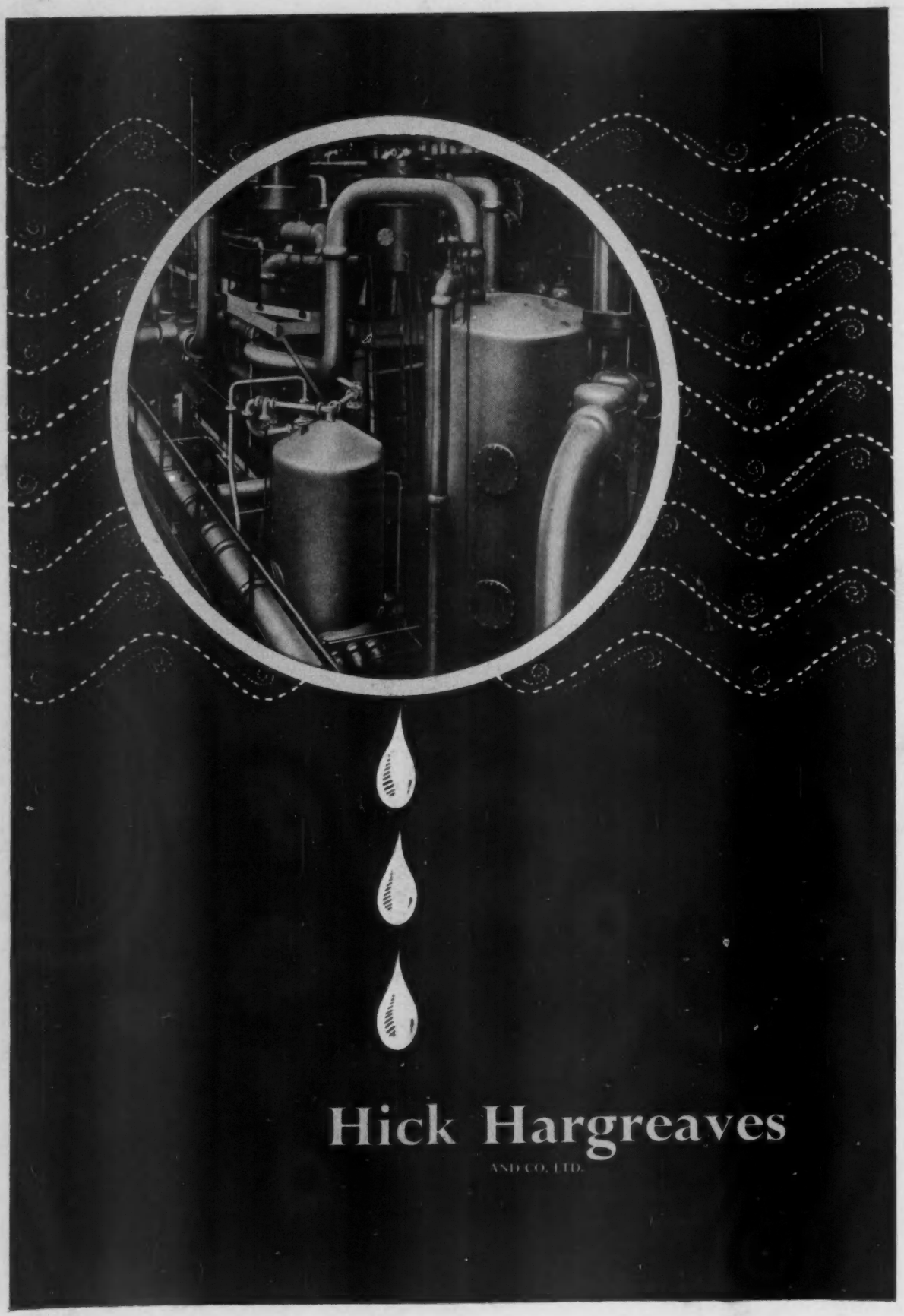
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